



Learning Interdependence and Mutual Trust in Environmental Policy Integration

three cases of urban transport governance

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6-8 April 2006, Hong Kong Convention & Exhibition Centre

Organized by The Centre of Urban Planning & Environmental Management,
The University of Hong Kong

Programme & Book of Abstracts



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12th Annual International Sustainable Development Research Conference
April 6-8, 2006 – Hong Kong Convention and Exhibition Centre

Technical Program

Thursday, 6 April 2006

8:00 AM-9:00 AM

Registration

9:00 AM-10:30 AM

1 Plenary 1 Opening Session: Tri-partite Partnership for

Sustainable Development

Room 301

Welcome Speech: **Professor Peter Hills**, Professor and Director, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

Keynote Speech: **Mr. Roy Tang**, Deputy Director of Environmental Protection, Hong Kong SAR Government

Keynote Speech: **Mrs. Betty Yuen**, Managing Director, CLP Power Hong Kong Limited

Keynote Speech: **Mr. Albert Lai**, Chairman, Hong Kong People's Council for Sustainable Development

Keynote Speech: **Ir. Otto Poon**, B.B.S., Member, Council for Sustainable Development

10:30 AM-11:00 AM

Tea Break

11:00 AM-12:30 PM

2 Corporate Social Responsibility (1)

Room 301

Chair: Kerrie MacPherson, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

2-1 Analysis of Determination Factors for Corporate Environmental Behaviors

Bing Zhang, Jun Bi and Weili Jiang, Center for Environmental Management and Policy, School of the Environment, Nanjing University

2-2 Focus on Product Responsibility

Chris Nelson, Philip Morris Asia Limited

2-3 A Comparative Study of Corporate Social Responsibility (CSR) in the United Kingdom and China

Lai Yuet Man, University of Birmingham

2-4 An analysis of UK water company corporate sustainability reporting - comparisons and trends

Glynn Skerratt and Clodagh Murphy, Staffordshire University

3 Education

Room 304

Chair: Calbert H. Douglas, University of Salford

3-1 Environmental learning in a UK Higher Education Institution - developing competencies in sustainable development and environmental management

Calbert H. Douglas, University of Salford

3-2 Effective Environmental Education Program To Solve Social Dilemma

Hirohiko Suwa¹, Hitoshi Yamamoto², Isamu Okada³ and Toshizumi Ohta¹, (1) University of Electro-Communications; (2) Rissho University; (3) Soka University

3-3 Dynamics of Environmental Education - An Overview of Portuguese Context

Luisa Schmidt, Instituto de Ciencias Sociais da Universidade de Lisboa

3-4 An Alternative Model of Environmental Education: The Experiences of Participatory Methodology Applied to the EPA in the Northern Coast the State of Bahia

Angelica Reboucas and Bartholomeu Reboucas, Universidade do Estado da Bahia, Brazil

3-5 The Role Of E-learning In Sustainable Development Of An Industry Through Online Education To Employees

Gnr Prasad and A. Vinaya Babu, CBIT, Gandipet, Hyderabad, India

3-6 Education of managers - factor of sustainable development - The Case of Russian firms in 2001 - 2004.

Raimo Blom¹, Harri Melin², Alfred Sarno³ and Irina Sarno¹, (1) University of Tampere; (2) University of Turku; (3) St. Petersburg University of Economics and Finance

4 Energy and Climate Change (1)

Room 305

Chair: Suresh Kant Verma, Institute of Technology and Engineering, A/P Malegaon (BK), Tal. Baramati, Dist-Pune, India

4-1 The effects of urbanization on the intensity of the urban heat island: A case study on the city of Kuala Lumpur, Malaysia

Ilham S.M. Elsayed, Sudan University of Science and Technology

- 4-2 Effect of Cover Materials on Heat and Mass Transfer Coefficients in Plastic Solar Still
Mahadeo Krishna Phadatare and Suresh Kant Verma, *Institute of Technology and Engineering, A/P Malegaon (BK), Tal. Baramati, Dist-Pune, India*
- 4-3 Indicators for Sustainability Assessment of Energy Systems -The RedImpact Project
Regina Eich¹, Wilhelm Kuckshinrichs¹, Werner von Lensa², Sven Tittelbach² and Tobias Bodewig², (1) *Systems Analysis and Technology Evaluation (STE), Forschungszentrum Jülich GmbH, Germany; Institute for Safety Research and Reactor Technology (ISR), Forschungszentrum Jülich GmbH, Germany*
- 4-4 Sources of Fine Particle Air Pollution in Several Major Cities in China
Mei Zheng¹, James J. Schauer², Mike H. Bergin¹, Lynn Salmon³ and Gayle S. W. Hagler¹, (1) *Georgia Institute of Technology; (2) University of Wisconsin; (3) California Institute of Technology*
- 5 Methodological Issues of Sustainable Development Room 307**
Chair: Arnim Wiek, ETH Zurich
- 5-1 Inverting sustainable development? - Rethinking ecology, innovation and spatial limits
Rasmus A. Karlsson, *Department of Political Science, Lund University*
- 5-2 The Competitive Global City 2030: A Futures Approach
Patricia Ruth Kelly, John Stanyon Ratcliffe, Julie Noelle Gannon, *The Futures Academy, Faculty of the Built Environment, Dublin Institute of Technology, Ireland*
- 5-3 Meta-game-based Scenario Analysis: Case Study of Tokyo Regional Transport Planning
Hironori Kato, Hideaki Shiroyama and Yoshinori Nakagawa, *University of Tokyo*
- 5-4 The Application of Methodologies to more Effective Product Design
L. N. Green, *The University of New South Wales, Sydney, Australia*
- 6 Ecological Impacts and Footprints Room 308**
Chair: Serif Basoglu, Xiamen University
- 6-1 Ecological Impacts of Secondary Coastal Roadways
Xiong-zhi Xue, Xiu-li Cao and Serif Basoglu, *Xiamen University*
- 6-2 Ecological Footprinting in UK Local Government: closing the 'science-policy' gap
Andrea Collins, *Cardiff University, UK*
- 6-3 Development of Metabolism Accounting Methods for Sustainability Monitoring in Settlements - Ecological Footprint as a Comparative Measurement Tool
Foley Walter, Richard Moles, Bernadette O'Regan, *Centre for Environmental Research, University of Limerick*
- 6-4 Taiwan's Ecological Footprint: From 1994 to 2003
Yung-Jaan Lee, Meng-Fang Wu and Shih-Jian Lin, *Graduate Institute of Architecture and Urban Planning, Chinese Culture University*
- 6-5 Urbanization Quantified by Ecological Footprint
Liang Chen, Zhao Honglin, Chen Donghui, *School of Environmental Science and Engineering, Donghua University*
- 6-6 The Xiamen Regional Sand Management, Environmental Impact And Assessment Project
Serif Basoglu¹, Huai yan Lei¹, Zhan rong Guo¹, Yuezhong Shi¹, Mark Luo¹ and Xiuli Cao², (1) *State Key Laboratory of Marine Environmental Sciences, College of Oceanography and Environmental Sciences, Xiamen University; (2) Environmental Science of Ministry of Education, Ministry of Education Environmental Science Research Center, Xiamen University*
- 7 Waste Management (1) Room 309**
Chair: Faten Al-Attar, Academic: College of Health Science, PAAET and Private: ECO Environmental Consultants
- 7-1 Public-Private Partnerships for Municipal Solid Waste Management Projects
Torsten Kleiss, *Bauhaus University Weimar, Chair of Construction Economics, Germany*
- 7-2 Liberalisation of municipal waste handling - compatible with sustainable practices?
Ole Busck, *Aalborg University*
- 7-3 Semi-Centralised Infrastructure Systems - Integrated Systems for a Sustainable Development of Fast Growing Urban Areas
Hans Reiner Boehm, Susanne Bieker, Alexandra Selz, *Section Environmental and Spatial Planning, Institute WAR, University of Technology, Germany*
- 7-4 Practice of Zero Waste in Taiwan-Implementation of Mandatory Garbage Sorting
Chih-Ku Chen, Hsiao-Chin Cheng and Fan-Jung Meng, *Sustainable Environment Engineering Consultants Co. Ltd*
- 8 Transport (1) Room 311**
Chair: Anthony Yeh, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
- 8-1 Sick of the Traffic: exploring the urban design, transport and health nexus
Ryan William Falconer¹, Jeffrey Kenworthy¹, Billie Giles-Corti², (1) *Institute for Sustainability and Technology Policy, Murdoch University, Western Australia, (2) School of Population Health, University of Western Australia*
- 8-2 Sustainable urban mobility in Europe and in Asia
Elisabetta Venezia¹ and Justyna Karakiewicz², (1) *Department of Economics, University of Bari, Italy; (2) The University of Hong Kong*
- 8-3 A Study on Urban Ecological Traffic Planning in China

Yaping Zhang and Yuhui Zuo, *Environment Department, Nanjing University, China*

9 Sustainable Cities (1)

Room 312

Chair: Aaron Mathias Vallejo, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

9-1 Planning of Al-Subiya New City, Kuwait

Ali Muhammad Khuraibet and Faten Al-Attar, *Academic: College of Health Science, PAAET and Private: ECO Environmental Consultants*

9-2 Integrating Environmental Considerations into Urban Redevelopment Projects: An Analysis of the Environmental, Economic, and Public Health Benefits of the 22@ Project in Barcelona, Spain

Robin Charlotte Ried, *J. William Fulbright Scholarship, United States Department of State*

9-3 Cities, Sustainability and Industrialization in China: A Case Study from Zhengzhou City, Henan Province

Dongyong Zhang, *Uma Kambhampati, Stephen Morse, University of Reading*

9-4 Conceptual Framework for a Sustainability Assessment Model for Urban Renewal Projects

Grace K. L. Lee and Edwin H.W. Chan, *The Hong Kong Polytechnic University*

12:30 PM-1:30 PM

Lunch: Buffet lunch

Room 201

1:30 PM-3:00 PM

10 Corporate Social Responsibility (2)

Room 301

Chair: Kerrie MacPherson, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

10-1 Engaging Hong Kong Businesses in Environmental Change: Drivers and Barriers

Stephen Siu Lun Tsang, Sonja Studer, Richard Welford and Peter Hills, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*

10-2 The Financial Market as a Vehicle for Protecting Human Rights: On Shareholder Activism

Emma Sjostrom, *SuRe Sustainability Research Group, Stockholm School of Economics*

10-3 Building a Sustainable Business in China's Small and Medium-sized Enterprises (SMES)

Jieqiong Yu¹ and Nigel Bell², *(1) The Centre of Urban Planning and Environmental Management, The University of Hong Kong; (2) Centre for Environmental Policy, Imperial College London, UK*

11 Systemic and Integrated Sustainability Assessment

Room 304

Chair: Daniel Lang, ETH Zurich

11-1 Resilience for Assessing Sustainable Urban Development

Ricardo Vieira¹, Sigrid Stagl², *(1) Sustainability Research Institute, School of Earth and Environment, University of Leeds; (2) SPRU, Freeman Centre, University of Sussex*

11-2 Complexity and Indicators of Sustainable Urban Development

Ricardo Vieira¹, Sigrid Stagl², Klaus Hubacek¹, *(1) Sustainability Research Institute, School of Earth and Environment, University of Leeds; (2) SPRU, Freeman Centre, University of Sussex*

11-3 A Methodological Framework for Indicators of Sustainable Development at the Regional Scale: The case of a Portuguese Region (Algarve)

P. Coelho¹, A. Mascarenhas², A. Franco², P. Vaz², I. Beja², A. Dores² and T. B. Ramos¹, *(1) Faculty of Marine and Environmental Sciences, University of Algarve, Portugal; (2) Algarve's Commission of Coordination and Regional Development*

11-4 Territorial analysis and Indicators: How to Measure the Sustainability of the Swiss Metropolitan Areas?

Christophe Mager, *University of Lausanne*

12 Conservation Case Studies

Room 306

Chair: Marina Botta, Royal Institute of Technology, School of Architecture

12-1 Marketization Propelled Environmental Protection of Rivers in Rural Area

Wenqing Li, Xiyuan Wang, Wenying Liu, Dongmei Jiang, Lili Liu and Genfu Lu, *School of the Environment, Nanjing University*

12-2 Nature Conservation policy in Bhutan

Chhewang Rinzin¹, Martin J. Wassen², Walter J. V. Vermeulen² and Pieter Glasbergen², *(1) Royal Institute of Management, Bhutan; (2) Utrecht University*

12-3 Waterfront and Coastal Environments: Competition or Complementarily? A Key Issues for Better Beach and Waterfront Management through Sustainable Conservation and Eco-tourism

Marcin Filip Jędrzejczak, *Academy of Ecology & Management in Warsaw*

12-4 A Study on the Protection of Biyang Donkey and the Development of Regional Ecological Economy

Gao Fei¹, Dongmei Jiang² and Ren Jiuchang³, *(1) Zhejiang University (2) Nanjing University and (3) Peking University*

12-5 Role of mangrove forests in sustaining lives and livelihoods of coastal communities

Ruchi Badola and S. A. Hussain, *Wildlife Institute of India*

- 13 Government Policy (1) Room 307**
 Chair: Anthony Yeh, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
 13-1 Removal of Barriers to Energy Efficiency in Catering Enterprises in Nairobi: Options for Nairobi City Council
Evans Kituyi and Carol Ochieng, Renewable Energy Technology Assistance Programme (RETAP), Kenya
 13-2 Zoning Implications on Sustainability in Jeddah, Saudi Arabia
Waleed Abdulaal, Department of Urban & Regional planning, King Abdulaziz University, Saudi Arabia
 13-3 Integrated Economic and Environmental Plans at National Level
Muawya Ahmed Hussein, Dhofar University, Sultanate of Oman
 13-4 Practice and Education - housing design and energy saving in Britain
Yun Gao, School of Art & Design, University of Huddersfield, UK
- 14 Eco-tourism (1) Room 308**
 Chair: Marcin Filip Jędrzejczak, Academy of Ecology & Management in Warsaw
 14-1 Global ecotourism opportunities: A missed opportunity for South Africa's ecotourism potentials and local economic development
Mokoko Piet Sebola, Tshwane University of Technology
 14-2 Ecotourism Priorities Study: Proactive Approach to Nature Conservation in Barangay Catigan, Toril, Davao City Philippines
Rowena Santos Delgado, University of the Philippines in Mindanao
 14-3 Bridging biodiversity and tourism towards sustainable development of sandy beaches
Marcin Filip Jędrzejczak¹, Lorenzo Chelazzi², Isabella Colombini^{2,3}, Felicita Scapini³ and Jan Marcin Węśławski⁴, (1) Academy of Ecology & Management in Warsaw; (2) Centre of Study of Tropical Faunistics and Ecology – CNR, Italy; (3) Department of Animal Biology and Genetics, University of Florence, Italy; (4) Department of Marine Ecology, Institute of Oceanology, Polish Academy of Sciences
- 15 Governance (1) Room 309**
 Chair: Mee Kam Ng, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
 15-1 Is Democracy Sustainable?
Peter Wells, Cardiff University
 15-2 Private Governance of Low Impact Design Features: A comparative Investigation of Issues
Jennifer Dixon and Marjorie van Roon, Department of Planning, University of Auckland, New Zealand
 15-3 Absence of Sustainable Governance for Health Crisis Management: the SARS Epidemic in Hong Kong
Dennis L.H. Hui and Mee Kam Ng, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
- 16 Natural Resources (1) Room 310**
 Chair: Sukhmani Kaur Mantel, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
 16-1 A material flow analysis of wood & paper in Cape Town: is there potential to redirect flows in formal and informal sectors to foster use as a renewable resource?
Christian Nissing and Harro von Blottnitz, Environmental & Process Systems Engineering Research Group, Chem. Eng. Dep., University of Cape Town
 16-2 Wastewater Treatment in Microbial Fuel Cell and Electricity Generation: A Sustainable Approach
Makarand Madhao Ghangrekar and V. B. Shinde, Indian Institute of Technology Kharagpur, India
 16-3 Life-Cycle Resource Efficiency of Conventional and Alternative Water Supply Systems
Nalanie Mithraratne and Robert Vale, Landcare Research
- 17 Transport (2) Room 311**
 Chair: Dong-Wook Song, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
 17-1 Environmental Impacts for Restraining Motorized Traffic at the City Centre: A Case of the City of Yogyakarta, Indonesia
Danang Parikesit¹, Intan Julianti², Restu Novitarini Djarwoningrum¹ and Juhri Iwan Agriawan¹, (1) The Centre for Transportation and Logistics Studies at Gadjah Mada University, (2) Ministry of Transportation, Jakarta
 17-2 Environmental Reform and Technological Innovation in Hong Kong's Public Transport Sector
Jacqueline Chi Kei Lam, Peter Hills and Richard Welford, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
 17-3 Institutional Change for Sustainable Urban Transport in Pakistan
Imran Muhammad and Nicholas Low, Urban Planning Department, Faculty of Architecture, Building and Planning, The University of Melbourne

3:00 PM-3:30 PM

Tea Break

3:30 PM-5:00 PM

- 18 Corporate Social Responsibility (3) Room 301**
Chair: Samuel Ka Yan Mak, Madison Communications
18-1 Sustainable Development and Corporate Social Responsibility for Outsourced Manufacturing
Van V. Miller¹, Michael J. Pisan² and Jerry Bouth², (1) Human & Ecological Research;
(2) Central Michigan University
18-2 Corporate Social Responsibility And Environmental Management: Relationships, Development And
Future Directions
Wing Kit Lau and Calbert H. Douglas, The Research Institute for the Built and Human
Environment, University of Salford
18-3 Corporate social responsibility and sustainable development: A role for representative business
networks?
Trevor William Goddard¹ and Sheila Purves², (1) Centre for Research into Disability and
Society, Curtin University of Technology; (2) Hong Kong Society for Rehabilitation
18-4 The challenges of government intervention in promoting corporate social responsibilities - insights
for Hong Kong, Pearl River Delta and Asia region
Samuel Ka Yan Mak, Madison Communications
- 19 Urban Modeling Room 304**
Chair: Dong-Wook Song, The Centre of Urban Planning and Environmental Management, The
University of Hong Kong
19-1 Evaluation Model of Material Flow Analysis and Its Application in Tongling City, China
Yuan Wang, Jie Chen, Bei Zhang, Jun Tian and Genfa Lu, School of the Environment,
Nanjing University
19-2 Design Support System for Sustainable Urban Development: Integrated framework of urban
modeling, spatial-environmental analysis and decision-making
Simon Yanuar Putra¹, Andrea Peresthu² and Perry Pei-Ju Yang¹, (1) Singapore
Millennium Foundation, National University of Singapore; (2) Faculty of Architecture, Delft
University of Technology, The Netherlands
19-3 Lessons Learned from GEF Project Development: Pedestrian and NMT Improvement Project for the
City of Surabaya, Indonesia
Danang Parikesit, Togar Silaban, Novitarini Djarwoningrum, The Centre for
Transportation and Logistics Studies, Gadjah Mada University
19-4 Urban Development Research Based on Wuli-Shili-Renli Systems Methodology
Xiao-dong Kou, Hui-feng Xue, Lin Yang, Northwestern Polytechnical University
- 20 Case Studies of Sustainable Development (1) Room 305**
Chair: Carmen Tsui, Kaizor Innovation
20-1 A Primary Study on Theory and Methods of Regional Talent Resource Plan Based on Coordinated
Development: Taking Xian City of Western China as an Example
Sheng-long Zhao¹, Hui-feng Xue¹, Kuan-min Lu³, Xiao-dong Kou¹, (1) Northwestern
Polytechnical University and (2) Xian University of Technology
20-2 The Definition of Sustainable Development in the European Union's Forest Policy: Back to Basics
Sonia Hadj-Ayed, School of Law, University of Leeds
20-3 China's Sustainable Growth: A Balanced Approach
Carmen Tsui, Kaizor Innovation
20-4 Implementing Sustainability Partnerships in Australian Regions: Challenges, Progress & Policy
Implications
Tavis Potts, Australian Expert Group in Industry Studies, University of Western Sydney
20-5 Chinese villages and their sustainable future
Heidi Dumreicher, Oikodrom
- 21 Eco-efficiency: Technique and Technology Room 306**
Chair: Aaron Mathias Vallejo, The Centre of Urban Planning and Environmental Management, The
University of Hong Kong
21-1 Influence of Sodium Polyacrylate on Soil Water Retention and Growth of Horticultural Plants.
Sultana Afroz and Bruce Sutton, Faculty of Agriculture Food and Natural Resources, The
University of Sydney, Australia
21-2 Eco-design in practice - Case study Computer Mouse
Andreas Schifflleitner and Marek Stachura, KERP - Centre of Excellence for Electronic
Scrap Recycling and Sustainable Product Design
21-3 Eco-Tech Planning for Turkish Cities
Şule KARAASLAN, Özge YALÇINER ERCOŞKUN, Department of Urban and Regional
Planning, Gazi University, Ankara-Turkey

- 22 Government Policy (2) Room 307**
22-1 Policy Frameworks That Support Eco-Industrial Parks: The Hinton EIP and Other Case Studies
Tracy Casavant, *Eco-Industrial Solutions Ltd*
22-2 Creative Financing for Sustainable Development
Jonathan L. Watkins, *University of Missouri-Kansas City*
22-3 Planning the Sustainable Eco-City in Taipei: Issues of Policy and Implementation
Szu-Li Sun, *Department of Real Estate and Planning, The University of Reading Business School*
- 23 Eco-tourism (2) Room 308**
23-1 Action Model for Sustainable Development at Long Valley
Lister Lai Ping Cheung¹, Katie H. L. Chick¹, Scott H. Linder¹ and B.C. H. Hau², (1) *The Conservancy Association; Department of Ecology & Biodiversity, The University of Hong Kong*
23-2 Tourism as Development Mechanism: a case of Bhutan
Chhewang Rinzin¹, Walter J.V. Vermeulen² and Pieter Glasbergen², (1) *Royal Institute of Management, Bhutan*; (2) *Utrecht University*
- 24 Governance (2) Room 309**
Chair: Jieqiong Yu, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
24-1 Good Environmental Governance Through EIA: The Case of Public Sector Development Projects In Pakistan
Obaidullah Nadeem and Rizwan Hameed, *Department of City & Regional Planning, University of Engineering & Technology, Lahore, Pakistan*
24-2 Mobilizing Stakeholders in Achieving Good Local Environmental Governance through a Coordinated Decision-making Network
Lu Xing, Jun Bi, Lei Shi, Haiyan Zhang and Lingxuan Liu, *School of Environment, Nanjing University, P.R.China*
24-3 Models for Eco-Management in Industrial Parks
Tiina Salonen, *University of Leipzig*
- 25 Natural Resources (2) Room 310**
25-1 Land use disputes in Ghana's mining communities: developing sustainable strategies
Louise Jayne Obara and Heledd Jenkins, *ESRC Centre for Business Relationships, Accountability, Sustainability and Society (BRASS)*
25-2 Is the environmental Kuznets Curve Valid in the Case of Food Consumption
Markus Valtter Vinnari, *Turku School of Economics and Business Administration, Finland Futures Research Centre*
25-3 Forest Management in Zagros Area: a situation analysis
Davood Samari and Somayeh Davari, *Islamic Azad University*

Friday, 7 April 2006

8:00 AM-9:00 AM

Registration

9:00 AM-10:30 AM

- 26 Plenary 2: Sustainable Cities – Moving Beyond the Rhetoric Room 301**
Chair: **Dr. Rebecca L.H. Chiu**, Associate Professor, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
Speaker: **Professor Peter Newman**, Professor of City Policy; Director, Institute for Sustainability and Technology Policy, Murdoch University; Chair, Sustainability Roundtable, Western Australian Government; NSW Sustainability Commissioner; Director 2001-2003, Sustainability Policy Unit, Department of Premier and Cabinet, Western Australian Government

10:30 AM-11:00 AM

Tea Break

11:00 AM-12:30 PM

- 27 Sustainable Cities (2) Room 304**
Chair: Kerrie MacPherson, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
27-1 Urban growth versus sustainability in Algeria. Case study of Algiers, the capital city
Farid Khalil, Polytechnic School of Architecture and Urbanism, Algiers, Algeria
27-2 It Takes a Village: A Scientific Design Process for Generating Sustainable Cities in China
Richard S. Levine, Michael T. Hughes and Casey Ryan Mather, Center for Sustainable Cities, University of Kentucky
27-3 Sustainability and citizenship values in low-income dwelling improvements in Maracaibo, Venezuela
Hugo Rodolfo Rincon, Elizabeth Tsoi, Marina González and José Padilla, School of Architecture and Design, University of Zulia, Venezuela
27-4 Urban land markets and Impact of Policy Intervention: A Case of Study of Phnom Penh, Cambodia
Tep Makathy and Tetsuo Kidokoro, International Development and Regional Planning Unit, Department of Urban Engineering, The University of Tokyo
27-5 Public Participation - A Good Practice towards Sustainable City Development
Bernard Wan Fung Lim and Andy Wan Ho Wong, Department of Architecture, The Chinese University of Hong Kong
- 28 Building Sustainable Development (1) Room 305**
Chair: Richard Welford, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
28-1 Sustainability Through "Cradle-To-Cradle" Concept
Salah Mahmoud El-Haggag, The American University in Cairo
28-2 Sustainable Development and Network Information
Khurram Shahid Delgado, Khurram Shahid Malik and Amir Niamat, Hope Worldwide-Pakistan
28-3 Economic Growth and Environmental Sustainability in Malaysia: An Empirical Analysis and Policy Options
Chamhuri Siwar, Md. Elias Hossain, Nik Hashim Nik Mustapha and Abdul Hamid Jaafar, Universiti Kebangsaan Malaysia
28-4 Sustainable Development, Eco-Industrial Networking, & Your Community Infrastructure: What Makes Infrastructure Sustainable?
Jim Ireland, Eco-Industrial Solutions
- 29 Product Design and Innovation Room 307**
Chair: Aaron Mathias Vallejo, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
29-1 The development and market success of environmental innovations
Fawzi Halila, Centre for Product Development Research (CPDR), School of Business & Engineering, Halmstad University
29-2 Investment in cleaner technologies by the Finnish industry
Eila Salomaa, Helsinki University of Technology
29-3 ProdTect - a flexible solution to design the End of Life Performance of products

Ioan Revnic and Gottfried Wanderer, *KERP Engineering*

- 30 Waste Management (2) Room 309**
 Chair: Faten Al-Attar, Academic: College of Health Science, PAAET and Private: ECO Environmental Consultants
 30-1 An Empirical Study on Solid Waste Management Amidst Urban Poverty
Chamhuri Siwar, Wahid Murad and Elias Hossain, *Institute for Environment and Development (LESTARI), Universiti Kebangsaan Malaysia*
 30-2 Industrial Recycle Network, the Pivotal Point for Sustainable
Xiaoqin Liu, Huasheng Xie and Jingling Bao, *Tianjin Academy of Environmental Science*
 30-3 Social Capital and Community-Based Solid Waste Management: A Case Study of Three Urban Communities in Songkhla, Thailand
Jawanit Kittitornkool, *Faculty of Environmental Management, Prince of Songkla University, Thailand*
- 31 Government Policy (3) Room 310**
 Chair: Richard Walker, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
 31-1 Novel Excessive Product Packaging Restrictions
Chih-Ku Chen, Jia-Pei Chen, Chih-Hao Shen and Hsin-Ying Chuang, *Sustainable Environment Engineering Consultants Co. Ltd.*,
 31-3 Sino-Australian Comparative Study of Environmental Policy and Sustainable Development
Wang Hua¹ and Stuart Menzies², (1) *Jiangsu Provincial Academy of Environmental Sciences*; (2) *Australian Volunteers International*
 31-4 Cleaner Production: An Effective Strategy for Sustainable Development in China
Lei Shi, Jun Bi and Lu Xing, *School of Environment, Nanjing University, P. R. China*
- 32 NGOs and Sustainable Development Room 311**
 Chair: Morrow Karen, School of Law, University of Leeds
 32-1 Environmental NGOs and the value systems behind their core activities
Yvonne Myrtha Scherrer, *Institute for Sustainable Management, University OAS North Western Switzerland*
 32-2 Measuring Social Capacity for Environmental Management in Transport Sector in Beijing Based on an Attitudinal Survey from the Perspective of Civil Society
Junyi Zhang and Akimasa Fujiwara, *Graduate School for International Development and Cooperation, Hiroshima University*
 32-3 Cooperative business-NGO partnerships in Hong Kong: NGO perspective
Sukhmani Kaur Mantel, Dennis Cheung, Richard Welford and Peter Hills, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
- 33 Social Dimensions of Sustainable Housing Room 312**
 Chair: Magda Mohamed Tawfik Metwally, Housing & Building Research Center, HBRC
 33-1 From Housing to Urban Vitality: a socio-cultural assessment
Qu Lei, *Delft University of Technology, the Netherlands*
 33-2 Spatial Configuration and its Effect on Community Space: A Study of Compact Built Environment in Hong Kong
Afroza Parvin, Arelen Min Ye and Beisi Jia, *Department of Architecture, The University of Hong Kong*
 33-3 Physical Deterioration of Urban Housing in Yangon Central Business District and Impacts on Social dimensions of Sustainability
Su Su and Swe Swe Aye, *Department of Architecture, Yangon Technological University, Yangon, Myanmar*
 33-4 Sustaining Human Ecology and Social Development in Large Public Housing Estates: Australian Multicultural Experience
Aida Morden, *University of New South Wales*
 33-5 Sustainable Public Housing Policy: Australian Multicultural Experience
Aida Morden, Bill Randolph and Bruce Judd, *University of New South Wales, Australia*

12:30 PM-1:30 PM

Lunch: Buffet lunch

Room 201

1:30 PM-3:00 PM

- 34 Transdisciplinary Research for Sustainable Development Room 304**
 Chair: Alexander Walter, ETH Zurich
 34-1 Stakeholder participation and networking in sustainable development
Michelle Boehme, *North-West University (Potchefstroom campus), South Africa*

- 34-2 Learning Interdependence and Mutual Trust in Environmental Policy Integration - three cases of urban transport governance
Carsten Jahn Hansen, *Department of Development and Planning, Aalborg University*
- 34-3 Researching development practice as a complex learning process
Christopher David Nelson, Paul Bryce and Juliet Willetts, *Institute for Sustainable Futures – University of Technology, Sydney (UTS)*
- 35 Building Sustainable Development (2) Room 305**
Chair: Kerrie MacPherson, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
- 35-1 Why Any Substantial Definition of Sustainability Must Fail - and Why This Is a Good, not a Bad Story
Paul Burger, *University of Basel*
- 35-2 Prospects and Challenges of Pursuing Sustainable Development on South-South Basis
Nim Dorji, *Sustainable Development Secretariat (SDS)*
- 35-3 Global environmental change and human health: A framework for vulnerability assessments
Henk Hilderink and Paul Lucas, *Netherlands Environmental Assessment Agency (MNP-RIVM)*
- 36 Indicators for Sustainable Industry Room 307**
36-1 A Total Quality Management (TQM) approach to determine an industrial sector's sustainability - a New Zealand electricity industry case study.
Bernard Cho Ming Cheng and David I. Wilson, *Auckland University of Technology, New Zealand*
- 36-2 Corporate Sustainability: Developing the Business Case
Rupert J. Baumgartner, *Department of Economics and Business Management, University of Leoben*
- 36-3 Social Audit As a Mechanism to Assess and Report on Corporate Sustainability
Jane Zhang, *Napier University*
- 36-4 A Sustainable Industries Performance Indicator Framework
T.E. Casavant, *Eco-Industrial Solutions Ltd*
- 36-5 Business and Community Based Rehabilitation (CBR): A creative alliance for sustainable development in China?
Trevor William Goddard¹ and Sheila Purves², *(1) Centre for Research into Disability and Society, Curtin University of Technology; (2) Hong Kong Society for Rehabilitation*
- 37 Life Cycle Assessment (1) Room 309**
37-1 Life Cycle Assessment of a Building Insulating Biomaterials. A case study on the keba-fibre thermo insulating board
Fulvio Ardente, Giorgio Beccali, Maurizio Cellura, Marina Mistretta and Orioli Aldo, *Dipartimento di Ricerche Energetiche e Ambientali*
- 37-2 Analyzing and Modeling of Life Cycle Assessment Database System
Yaping Zhang and Yuhui Zuo, *Environment Department, Nanjing University, China*
- 37-3 Combined Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) Study on the Sustainability Performance of a Public Housing Block in Hong Kong
Alex Amato and Felix Yat Hang Wong, *Department of Architecture, The University of Hong Kong.*
- 37-4 The Integration of Health Impact Assessment (HIA) Module with a Combined Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) Assessment Tool for Public Housing in Hong Kong
Felix Yat Hang Wong and Alex Amato, *Department of Architecture, The University of Hong Kong.*
- 38 Government Policy (4) Room 310**
Chair: Richard Walker, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
- 38-1 Institutional strengthes and barriers to apply the environmental negotiated agreements in China
Hans Th. A Bressers and Yanyan Xue, *Clean Technology and Environmental Policy Center (CSTM) / University of Twente, the Netherlands*
- 38-2 Impediments in Implementing Euro III Norms in India
Arun Aditya Sahay, *Center for Environmental Management, Management Development Institute, India*
- 38-3 Industry Responses to EU WEEE and ROHS Directives: Perspective from China
Jieqiong Yu, Peter Hills and Richard Welford, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
- 39 Assessment of Housing Sustainability Room 312**
Chair: Rebecca Lai Har Chiu, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
- 39-1 Measurable social sustainability indicators in the building environmental assessment tools: Hong Kong's Public Rental Housing (PRH) as a case study
Mohammad Faruk and Alex Amato, *The University of Hong Kong*

- 39-2 Tools for assessing the sustainability of housing development: indicators and criteria
Rebecca Lai Har Chiu, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
- 39-3 Potential of Electricity Savings of Buildings in Warm-Humid Climate
Matthias Haase and Alex Amato, *The University of Hong Kong*
- 39-4 Double-skin Facades and Airflow Windows For Energy-efficient Building Design
Matthias Haase and A. Amato, *The University of Hong Kong*

3:00 PM-3:30 PM

Tea Break

3:30 PM-5:00 PM

- 40 Sustainable Cities (3) Room 304**
- 40-1 Identity and Sustainable Renewal of the Main Street
Aleksandra Djukic and Eva Vanista-Lazarenic, *Faculty of Architecture University of Belgrade*
- 40-2 A Sustainable City - Where has our Heritage gone?
Hon Meng Wong, *HK Institute of Planners*
- 40-3 Inhabiting the Archipelago: Towards the construction of the Urban Green Building Tool - Venezuela
Mercedes Ferrer y Arroyo, *Instituto de Investigaciones Facultad de Arquitectura y Diseno Universidad del Zulia*
- 40-4 Social Impact Assessment of Urban Renewal Projects in Hong Kong
Kwan Kwok Leung, *Quality Evaluation Centre, City University of Hong Kong*
- 41 Building Sustainable Development (3) Room 305**
- Chair: **Aaron Mathias Vallejo**, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
- 41-1 Globalization and Sustainable Development: Reconciling the Irreconcilable?
Ravi Nunna Srinivas, *University of St. Thomas*
- 41-2 Another Strategy to Assess Sustainable Development
Yun-feng Chen¹, Gen-fa Lu¹, Jie Qi², *(1) Nanjing University; (2) Huazhong University of Science and Technology*
- 41-3 Building Our Sustaining World
Aaron Mathias Vallejo, *The University of Hong Kong*
- 41-4 KiwiGrow™ — a universal, ecosystem-based framework for sustainable development
Paul G. Luckman, *Creative Decisions Ltd, New Zealand*
- 42 Energy and Climate Change (2) Room 306**
- 42-1 The human factor in energy policy in small island states and territories: cases from the Caribbean
Kathy E. Stuart, *University of Prince Edward Island*
- 42-2 Sustainable Energy Research - A changing paradigm in the future?
J. F. Hake and Regina Eich, *Research Centre Juelich*
- 42-3 Does Global Change matter? - the Case of Industries in the Upper Danube Catchment Area
Matthias Egerer and Markus Zimmer, *Ifo Institute for Economic Research*
- 42-4 Factors behind change in CO2 emissions from fuel combustion - country rankings
Jarmo Vehmas and Jyrki Luukkanen, *Finland Futures Research Centre*
- 43 Case Studies of Business and Sustainable Development Room 307**
- Chair: **Jieqiong Yu**, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
- 43-1 Relationship between investment in environmental initiatives and firm competitiveness: A case of European textile finishing firms
Samarthia Thankappan, *Cardiff University*
- 43-2 The Business and Institutional Furniture Manufacturers Association International (BIFMA)
Bennett Lloyd Rudolph and Norman Christopher, *Seidman College of Business, Grand Valley State University*
- 43-3 Exploring sustainability of the potato supply chain in the UK
Natalia Yakovleva, *Cardiff University*
- 43-4 Putting Aggregate Quarrying under the Spotlight of Sustainability
Michalis F. Vaidanis and D. C. Kaliampakos, *National Technical University of Athens*
- 43-5 Sustainability Communication: Analysis of Websites of Companies Working in Bangladesh and Pakistan
Asghar Naeem Malik, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
- 44 Life Cycle Assessment (2) Room 309**
- 44-1 Enhancing the contribution of Life Cycle Interpretation to environmental analysis and decision making
Giannis Tsoulfas, Costas Pappis and Thomas Dasaklis, *University of Piraeus*
- 44-2 Analyzing and Modeling of Life Cycle Assessment Database System

Yaping Zhang and Yuhui Zuo, *Environment Department, Nanjing University, China*
44-3 A Study on Integrating Health Risk Assessment and Life Cycle Assessment.
Chia-Wei Chao, Hwong-Wen Ma and Ming-Lung Hung, *Graduate Institute of Environmental Engineering, National Taiwan University*

45 Government Policy (5) Room 310

Chair: Richard Walker, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*

45-1 Labors of Globalization: Emergent State Responses

Jonathan Bach and Scott Solomon, *University of South Florida*

45-2 Considerations about ISO 14001, and suggestions for the next revision

Tine Herreborg Jørgensen, *Aalborg University, Denmark*

45-3 SEA, Environmental Governance and Environmental Justice: A tale of two jurisdictions

Jennifer Elizabeth Dixon¹, Barbara Illsley and Tony Jackson², *(1) Department of Planning, University of Auckland; (2) The Geddes Institute, School of Town and Regional Planning, University of Dundee*

45-4 Is Circular Economy A Real Solution for China? An Analysis from Regional Perspective

Jun Bi, Bing Zhang and Shi Wang, *School of the Environment, Nanjing University*

46 Natural Resources (3) Room 311

46-1 Livelihoods strategies in a changing environment: Umutara case study in eastern part of Rwanda

Théophile Niyonzima, *Goteborg University*

46-2 Urban Water Resources Sustainable Development: A Global Comparative Appraisal

Manouchehr Vaziri and Reza Tolouei, *Department of Civil Engineering, Sharif University of Technology, Iran*

46-3 Basic Urban Service Delivery for the Slum Poor in Bangladesh Cities: Potentials and Limitations of Partnerships

Mallik Akram Hossain, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*

7:00 PM-9:30 PM

Conference Dinner: Chinese Banquet

Room 301

Saturday, 8 April 2006

8:00 AM-9:00 AM

Registration

9:00 AM-10:30 AM

- 47 Women and Minority Groups Room 301**
Chair: Morrow Karen, School of Law, University of Leeds
47-1 The Roles of Countrywomen in Controlling Non-point Source Pollution
Dongmei Jiang, Yuanfang Zhou and Genfa Lu, *Environment School of Nanjing University*
47-2 Global Governance and Gender: Gender Mainstreaming, Sustainable Development and the UN
Morrow Karen, *School of Law, University of Leeds*
47-3 Sustainable Mobility: An Implicit Function of 'Equity'
Tanu Priya Uteng, *Norwegian University of Science and Technology, NTNU*
- 48 Regional Planning Room 304**
Chair: Dilip Sankarreddy, Save Bombay Committee, NGO, India
48-1 The case of regional inequalities in the State of Santa Catarina/Brazil: an analysis of the different areas of employment
Marcos Ferasso, *Unoesc*
48-2 The Integration of the Sustainability in the Urban and Territorial Planning. A Look through the European and Basque Approach
Oscar Santa Coloma, Arantzazu Urzelai, Itziar Aspuru and Gemma Garcia, *LABEIN – Tecnalia*
48-3 Synergy for Sustainability A framework for rural-urban synergy for sustainable rural development
Momen Md Saiful, *Department of Urban and Regional Planning, University of Hawaii at Manoa*
- 49 Sustainability Assessment (1) Room 305**
Chair: Mee Kam Ng, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
49-1 Malaysian Urban Indicators Network (MURNInet) : From Pilot Project to 13 Cities Implementation
Kamalruddin Bin Shamsudin, *Federal Town and Country Planning Department Malaysia*
49-2 Research on quantitative assessment of economic sustainable development of Jiangsu province
Bangcheng Cai, Genfa Lu, Dongmei Jiang, Shangfu Han and Lijuan Song, *School of Environment, Nanjing University*
49-3 Sustainability Impact Assessment in Hong Kong and the Pearl River Delta is "Both Necessary and Impossible"?
Mee Kam Ng, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*
49-4 Community Sustainable Development Indicators: Case Study of Mingshan Neighborhood, Taipei, Taiwan
Shih-Chien Lin, Yung-Jaan Lee, Po-To Chen and Jia-Gung Yeh, *Graduate Institute of Architecture and Urban Planning, Chinese Culture University*
- 50 Environmental Management (1) Room 306**
Chair: Jing Xia, State Key Laboratory of Pollution Control and Resource Reuse, Nanjing University, China; Jiangsu Provincial Academy of Environmental Science, Nanjing
50-1 Self-reported environmental awareness and Willingness to pay for environmental protection: A survey in Hong Kong
Wai Kee Yuan, *Hong Kong Shue Yan College*
50-2 Environment and Safety Management Systems: A Case Study at ENEA Research Centre
Donato Viggiano, *Italian National Agency for New Technologies, Energy and the Environment (ENEA)*
50-3 Environmental Risks Analysis and Management of Yangtze River Basin (Jiangsu)
Jie Yang^{1,2}, Jun Bi¹, Jingbo Zhou¹, Haiyan Zhang¹, Qiliang Li¹ and Lei Shi¹, *(1) State Key Laboratory of Pollution Control & Resource Reuse, School of the Environment, Nanjing University; (2) University of Science and Technology of Suzhou*
- 51 Industrial Ecology (1) Room 307**
Chair: Pauline Deutz, University of Hull
51-1 Social Dimension of Industrial Ecology: On the Implications of the Inherent Nature of Social Phenomena
Walter J.V. Vermeulen, *Copernicus Institute for Sustainable Development and Innovation, Utrecht University*
51-2 Of Butterflies and Hummingbirds: Industrial Ecology 'On the Wing'
Van Miller, *Human & Ecological Research*

51-3 Industrial Ecosystems: An Evolutionary Classification Scheme

James Scott Baldwin, *University of Sheffield*

52 Natural Resources (4)

Room 308

Chair: Aaron Mathias Vallejo, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

52-1 The use of 'wastes' as resources: treating contaminated water

Karen Lousie Johnson¹, Selina Bamforth², David Manning² and Ian Singleton², (1) *University of Durham*; (2) *University of Newcastle upon Tyne*

52-2 Is Water Pollution Risk More Acceptable in China?

Haiyan Zhang, Jun Bi, Lu Xing and Lei Shi, *State Key Laboratory of Pollution Control & Resource Reuse, School of the Environment, Nanjing University*

52-3 An Initial Study on Water Purification with Grass Cultivation in Net Cage

Tian Xie¹, Fushou Zhu², Junsan Wang³ and Gang Chen⁴, (1) *Research Institute of Environment Sciences of Guizhou Province*; (2) *Education College of Guizhou Province*; (3) *Southern China Institute of Environmental Sciences under NEPA*; (4) *Agriculture School of Yangzhou University*

53 Case Studies of Sustainable Development (2)

Room 311

Chair: Roger C. K. Chan, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

53-1 Sustainable Transdisciplinary Integrated Planning for Post-Tsunami Reconstruction Activities in Sri Lanka

Arnim Wiek and Katja Brundiers, *Swiss Federal Institute of Technology Zurich (ETH)*

53-2 Urban Agglomeration, Planning and Sustainability in China

Roger C. K. Chan, *The Centre of Urban Planning and Environmental Management, The University of Hong Kong*

53-3 Sustainable Concepts in Technology and Ecology in a Chinese Village

Hua Zhang¹, Yukai Wang² and Hongyi Lu³, (1) *College of Civil Engineering and Architecture, He Nan University of Technology*; (2) *Zhengzhou Urban Plan and Survey Institute*; (3) *College of Architecture, Zhengzhou University*

54 Government Policy (6)

Room 312

Chair: Ian Morley, Ming Chuan University

54-1 From Cruel Coketown to Humanitarian Letchworth: Were the Victorians Sustainable Developers?

Ian Morley, *Ming Chuan University*

54-2 Environmental Policy for Sustainable Cities: The Swedish Environmental Quality Objective "A Good Built Environment"

Karin Helen Edvardsson, *Department of Philosophy and the History of Technology, Royal Institute of Technology, Stockholm*

54-3 Dutch Environmental Outlook: Many gains possible with technology and international co-operation

Annemarie van Wezel and Hans Nijland, *Netherlands Environmental Assessment Agency*

10:30 AM-11:00 AM

Tea Break

11:00 AM-12:30 PM

55 Planning for Sustainable Building

Room 301

Chair: Christopher Paris, School of Built Environment, Faculty of Engineering, University of Ulster

55-1 Design and Construction of Sustainable Tourist Projects in Egypt: A New Framework for the Project Delivery Process

Ahmed Sherif¹ and Medhat Etman², (1) *The American University in Cairo* and (2) *Integration-Bureau of Architecture- Egypt*

55-2 Integrating Responsive Building Elements In Buildings

Matthias Haase¹, Alex Amato¹ and Per Heiselberg², (1) *The University of Hong Kong* and (2) *Aalborg University, Denmark*

55-3 Exploring life in innovative high density housing in the UK

Joanne Bretherton, *Centre for Housing Policy, University of York, UK*

55-4 Urban Sustainable Development Research on Permanent Earthquake Housing: A Developing Country Example Adapazari

Sule Karaaslan and Ozge Yalciner Ercoskun, *Department of Urban and Regional Planning, Gazi University, Ankara*

56 Sustainable Urban Design

Room 304

56-1 "Ecological Planning" Concept for Urban Design at East Coast Area, Haikou City, China

Xinliang Liu, *University of Dortmund, Germany*

56-2 Urban-I-graph ® a graphical assistant for the sustainability of "large scale" projects for low-income groups in Maracaibo, Venezuela

Marina Amelia Gonzalez de Kauffman, Instituto de Investigaciones Fac. de Arquitectura y Dise Universidad del Zulia / Fundacion Habitat LUZ

56-3 Building Urban Poor Community in Isaan: Design, Planning and Empowerment

Sakkarin Sapu¹, Nattawut Usavagovitwong², (1) Faculty of Architecture, Urban Design and Creative Arts, Mahasarakham University, Thailand, (2) Faculty of Architecture, Sripatum University, Thailand

57 Sustainability Assessment (2)

Room 305

Chair: Yung-Jaan Lee, Graduate Institute of Architecture and Urban Planning, Chinese Culture University

57-1 Sustainable Development Indicators for Taipei, Taiwan: Components and their inter-relationship
Yung-Jaan Lee, Graduate Institute of Architecture and Urban Planning, Chinese Culture University

57-2 Development of Urban Sustainability Indicators and indices - evaluation of the sustainability of Irish settlements and settlement patterns

John Morrissey, Bernadette O'Regan and Richard Moles, Centre for Environmental Research, University of Limerick, Ireland

57-3 How to deal scientifically with values in sustainability issues? A methodological analysis of two projects.

Paul Burger, University of Basel

57-4 Impact evaluation of transdisciplinary research processes

Alexander Walter and Arnim Wiek, Swiss Federal Institute of Technology Zurich (ETH)

58 Environmental Management (2)

Room 306

Chair: Kerrie MacPherson, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

58-1 What Is the Maximum Acceptable Risk Level in China?

Jun Bi, Haiyan Zhang, Jie Yang and Weili Jiang, School of the Environment Nanjing University

58-2 Environmental Management Systems and Sustainable Development

Magdalena Rybaczewska-Blazejowska, Brandenburg Technical University, Cottbus Germany

58-3 EcoStart - a Finnish Environmental Management System for SME's

Timo Juhani Lehtonen, Regional Council of Etela-Savo

58-4 The effect of Environmental Management Systems on waste awareness in Finnish metal engineering SMEs

Sisko Kvist, Eva Pongrácz and Riitta Keiski, University of Oulu

59 Industrial Ecology (2)

Room 307

Chair: Donald Isidore Lyons, University of North Texas

59-1 Industrial ecosystems in Europe: Different facets of sustainable niches

Mouzakitis Yannis, Adamides Emmanuel and Goutsos Stavros, University of Patras

59-2 Industrial Ecology and Material Cycling: Toward closing the loop on material use.

Donald Isidore Lyons, University of North Texas

59-3 Building Local Institutional Base for Industrial Ecology: Pathway towards a Sustainable Urban Development for the Pearl River Delta

Xin Tong, Peking University

59-4 End of Life Vehicle Directive as regulation for interfirm co-operation: a critical study of industrial ecology as a policy initiative

Pauline Deutz, University of Hull

60 Workshop on Project SUCCESS (1)

Room 309 - 310

Chinese Villages and their Sustainable Future

Chair: Heidi Dumreicher, Oikodrom – Forum Nachhaltige Stadt, The Vienne Institute for Urban Sustainability

This workshop will introduce to the delegates an innovative participatory approach which helps to chart a sustainable course for future of the rural area. This approach emphasizes new, interdisciplinary and transdisciplinary negotiation processes whereby the local knowledge and the expert knowledge find common ground. As has been demonstrated through its application in seven Chinese cities, the outcome of this approach is manifold. As a gesture of courtesy, each participant will receive a free copy of the bilingual poster (Chinese and English) which summarizes the outcome of its application in these seven Chinese cities.

61 Case Studies of Sustainable Development (3)

Room 311

Chair: Dilip Sankarreddy, Save Bombay Committee, NGO, India

61-1 Acupuncture Method - Sustainable Planning In Experimental Case Study of Xiafutou Village

Limin Li¹, Hongyo Lu² and Hua Zhang³, (1) Xi'an University of Architecture and Technology, (2) Zhengzhou University and (3) Henan Civil Engineering University

61-2 MFA-based Analysis of Sustainable Development in China

He-ping Huang and Jun Bi, State Key Laboratory of Pollution Control & Resource Reuse, School of the Environment, Nanjing University

61-3 The explanation of relation between social capital and quality of life

Gholamreza Ghaffary and Nazmohammad Ounagh, *Social Insurance*

- 62 Sustainable Cities (4) Room 312**
 Chair: Aaron Mathias Vallejo, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
 62-1 The Challenge to Sustainable Development of Urban Slums with particular Reference to Dhaka
Rowshan Mamtaz, *Bangladesh University of Engineering and Technology*
 62-2 Compact residential developments and its effect on sense of community in contemporary China - Cases studies in urban Guangzhou
Yingqing Ou, Beisi Jia and Stephen S.Y. Lau, *The University of Hong Kong*
 62-3 Sustainable Development of the Egyptian Village - Demonstration Project at El Hay Village - Giza Governorate
Magda Mohamed Tawfik Metwally, *Housing & Building Research Center, HBRC*
 62-4 Sustainable Development and Transit-Oriented Development Cities in Taiwan
Chia-Nung Li and Tsung-Yu Lai, *Department of Land Economics, National Chengchi University, Taiwan*

12:30 PM-1:30 PM

Lunch: Japanese Tray Meal

1:30 PM-3:00 PM

- 63 Building Preservation Room 301**
 63-1 The Role of Participatory in the Upgrading and Preservation Process of the Vernacular Architectures
Hongyi Lu¹, Limin Li² and Hua Zhang³, (1) Zhengzhou University, (2) Xian University of Architecture and (3) Henan Civil Engineering University
 63-2 The need and the meaning of sustainable renovation
Marina Botta, *Royal Institute of Technology, School of Architecture*
 63-3 Vernacular House pattern in Chinese villages - A systematic thought to the Nature and Society
Qing Zheng, Hongyi Lu and Xiu Shi, *College of Architecture, Zhengzhou University*
- 64 Sustainability Assessment (3) Room 305**
 Chair: Sukhmani Kaur Mantel, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
 64-1 How to sustainably optimize a system? - A comparison among scenario-based assessment, impact assessment, and systemic assessment
Daniel Lang and Arnim Wiek, *Swiss Federal Institute of Technology Zurich (ETH)*
 64-2 SEA as a Tool to Achieve Sustainable Development in Hong Kong and the Pearl River Delta
Elvis WK Au and H.M. Wong, *Environmental Protection Department, HKSARG*
 64-3 Is Milton Keynes a Sustainable City? A sustainability assessment of its energy use past, present and future
Helena Titheridge, *University College London*
 64-4 Sustainable Development Indicators As Catalysts of Urban Change
Clara Landeiro, *CESUR - IST - Technical University of Lisbon*
 64-5 Measuring Regional Sustainability - lessons to be learnt
Anne Maree Wallis and Anneke Richards, *Deakin University*
- 65 Energy and Climate Change (3) Room 306**
 Chair: Aaron Mathias Vallejo, The Centre of Urban Planning and Environmental Management, The University of Hong Kong
 65-1 Geothermal Energy for Sustainability
Daisy Badilla, *Ateneo de Naga University*
 65-2 Urban Energy Systems Engineering
Paul Rutter, Nilay Shah and Cristina Romano, *Imperial College London*
 65-3 Local Housing Action, Energy Retrofitting and Sustainable Energy Use for Wellbeing and Sustainable Communities
Kay Saville-Smith, *Centre for Research, Evaluation and Social Assessment*
 65-4 The Success Project - Energy analysis and sustainable development
N. D. Mortimer¹ and John Francis Grant², (1) North Energy Associates Ltd; (2) Sheffield Hallam University
 65-5 Psychological Aspect to the Solar Energy Utilization in Bilbao
Eduardo Rubio-Ardanaz and Xiao Fang, *University of Basque Country*
- 66 Primary Industries Room 308**
 66-1 A Multifunctional Agriculture for China - Considerations following a strong sustainability approach
Veronika Praendl-Zika, *The Vienna Institute for Urban Sustainability, Oikodrom*
 66-2 Opportunities and constraints for a chain-network conversion towards sustainable dairy production in The Netherlands.

Arnoud A.H. Smit, P. P. J. Driessen and Pieter Glasbergen, *Copernicus Institute for Sustainable Development and Innovation*

66-3 Energy and Environmental Analysis of an Italian Wind Farm

Fulvio Ardente¹, Gorgio Beccali¹, March Beccali¹, Maurizio Cellura¹ and Robert Intili², (1) *Department of Energy and Environmental Researches, University of Palermo* and (2) *Sicily ENEL Scienze*

66-4 Conflict Between Agricultural Industrial Structure and Non-point Source Pollution in Lake Tai region and its Countermeasures - Case of Dapu town

Dongmei Jiang¹, Xiangying Yu², Minghui Liu² and Genfa Lu³, (1) *Environment School of Nanjing University*, (2) *Zhengzhou Teacher College* and (3) *Nankai University*

67 Workshop on Project SUCCESS (2)

Room 309 - 310

Chinese Villages and their Sustainable Future

Chair: Heidi Dumreicher, Oikodrom – Forum Nachhaltige Stadt, The Vienne Institute for Urban Sustainability

This workshop will introduce to the delegates an innovative participatory approach which helps to chart a sustainable course for future of the rural area. This approach emphasizes new, interdisciplinary and transdisciplinary negotiation processes whereby the local knowledge and the expert knowledge find common ground. As has been demonstrated through its application in seven Chinese cities, the outcome of this approach is manifold. As a gesture of courtesy, each participant will receive a free copy of the bilingual poster (Chinese and English) which summarizes the outcome of its application in these seven Chinese cities.

68 Case Studies of Sustainable Development (4)

Room 311

Chair: Jing Xia, State Key Laboratory of Pollution Control and Resource Reuse, Nanjing University, China; Jiangsu Provincial Academy of Environmental Science, Nanjing

68-1 Population Amount Research during the Eleventh Five-plan of Jiangsu Province

Ning Liu, Genfa Lu and Yuan Wang, *Environment School of Nanjing University*

68-2 Ecological Jiangsu Initiative Assisted by the Experience of Sustainable Development in the Austrian State of Victoria

Jing Xia¹², Stuart Menzies², Wanghua² and Bi Jun¹, (1) *State Key Laboratory of Pollution Control and Resource Reuse, Nanjing University, China*; (2) *Jiangsu Provincial Academy of Environmental Science, Nanjing*

68-3 The payment of the public services in poor communities: An indicator of responsibility for financial and social sustainability of a development program. The case of the Program "Full Citizenship" – PCP-. Municipality of Maracaibo, Venezuela.

Marina González de Kauffman and Estela Peña, (1) *Universidad del Zulia –LUZ- University*; (2) *Servicio Fondo de Desarrollo Microfinanciero de Maracaibo Alcaldía de Maracaibo*

69 Sustainable Cities (5)

Room 312

Chair: Dilip Sankarreddy, Save Bombay Committee, NGO, India

69-1 Community Plans for Sustainable Living

Bev James¹, Kay Saville-Smith², (1) *Public Policy & Research, Wellington*, (2) *Centre for Research Evaluation and Social Assessment, Wellington*

69-2 Optimum population density and agglomeration of cities in terms of energy saving

Kenichi Imai, *Kinki University Technical College*

69-3 The New Built Environment in the UAE: Globalization versus Sustainability and Local Identity

Seif Khiati, *UAE University*

69-4 Emerging cities in India and China: Enormity of challenges to ordered development

Dilip Sankarreddy, *Save Bombay Committee, NGO, India*

3:00 PM-3:30PM

Tea Break

3:30PM-5:00PM

70 Plenary 3 Closing Ceremony: Sustainable Development

and Globalization

Room 301

Chair: **Dr. Richard Welford**, Associate Professor, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

Keynote Speech: **Professor Joachim H. Spangenberg**, Vice-President, Sustainable Europe Research Institute; Professeur Invite, University of Versailles St. Quentin-en-Yvelines, "Sustainable Development in a Globalising World- Dealing with Complexity European Approaches and Experiences"

Keynote Speech: **Professor Qian Yi**, Professor, Department of Environmental Science and Engineering, Tsinghua University; Academician, Chinese Academy of Engineering, "Circular Economy and Urban Sustainability-Challenges and Experiences in China"

Keynote Speech: **Mr. C. K. Lau**, Executive Editor (Policy), South China Morning Post, "Globalisation, Sustainable Development and the Media"

Closing Remarks: **Dr. Richard Welford**, Conference Chair

Abstracts

2-1 Analysis of Determination Factors for Corporate Environmental Behaviors

Bing Zhang, Jun Bi and Weili Jiang, Center for Environmental Management and Policy, School of the Environment, Nanjing University

Corporations in China do not have the risk management strategy of MNCs by improving their environmental performance. Voluntary compliance is not popular among firms of various ownerships and scales. In the past two decades, governments in China have been seeking effective tools to improve corporate environmental behavior and performance. In the meantime, the market-based economy and a growing civil society are playing their unique roles for better environmental performance. Few empirical studies have been conducted in China to identify the most effective weapons in this campaign. A better understanding about the determinant factors that shape better corporate environmental behavior and performance will be helpful in establishing effective government policies.

This paper will use questionnaires to survey a group of corporations in Jiangsu Province and evaluate environmental behavior and performance by constructing an indicator system at firm level. Secondly, the study will identify potential external (including governmental, market and community interventions) and internal variables such as management structure, ownership, size, and financial status that shape environmental behavior and performance. Finally, the paper will decide the determinant factors among external and internal variables by establishing econometric models. The research results will provide solid basis for the decision-making of different stakeholders.

2-2 Focus on Product Responsibility

Chris Nelson, Philip Morris Asia Limited

Some people suggest that there is a contradiction in the belief that a tobacco company can be responsible or that it should participate in discussions on corporate responsibility. Philip Morris International (PMI) would like to be heard on the topic. Cigarettes and other tobacco products are lawfully made and sold and consumed by one billion people around the world. The issue is not the product: it is how one deals with the product.

This paper outlines the actions that PMI is taking actively address tobacco product issues and to reduce the harm caused by cigarettes. This includes: working with governments and the public health community as they develop comprehensive tobacco regulation, communicating clearly about the health effects of smoking, preventing youth from smoking and developing products that have the potential to be less harmful.

2-3 A Comparative Study of Corporate Social Responsibility (CSR) in the United Kingdom and China

Lai Yuet Man, University of Birmingham

This project attempts to compare the corporate social responsibility (CSR) of oil firms in China – PetroChina and United Kingdom – British Petroleum. The study is mainly focus on three aspects: safety, environment and local communities. Based on the finding, it suggests that UK oil company tends to be more aware the CSR transparency than Chinese oil company in terms of stakeholder map, activities and strategies. In addition, by using the context analysis on the CSR reports of PetroChina in different year and language version, this study found that Chinese version use more exaggerate wordings than the English one and Chinese company have a tendency to enhance their transparency.

2-4 An analysis of UK water company corporate sustainability reporting - comparisons and trends

Glynn Skerratt and Clodagh Murphy, Staffordshire University

The UK water sector has experienced great change over the last three decades. Since privatisation in 1989, water companies have increasingly sought to evidence responsible environmental stewardship by producing detailed environmental (and latterly sustainability or corporate social) reports for their stakeholders. There is significant variation in the style and content of these reports and this makes comparison difficult. In addition, some water companies are part of a larger company grouping and there may only be a group report available.

This paper examines the philosophies that underpin a number of the most recent water companies' sustainability reports and undertakes a rigorous comparative analysis to elucidate areas of commonality, differences and trends in style and substance based on, amongst other criteria, the Global Reporting Initiative (GRI) criteria. The paper systematically addresses questions such as: what are the companies reporting on, why do they report in the way that they do and who is the principal constituency for whom the report is written? Finally, the paper examines evidence for the reports adherence to international reporting guidelines/process standards and evidence of 3rd party verification. It also examines ways in which we might expect subsequent reports to differ from the current batch by examining likely future drivers.

3-1 Environmental learning in a UK Higher Education Institution - developing competencies in sustainable development and environmental management

Calbert H. Douglas, University of Salford

This paper reports the findings of a research project carried out at the University of Salford to investigate the approaches followed and the role that negotiated environmental consultancy projects carried out for external

corporate organizations play in developing their environmental education and sustainable development awareness and by this student-centred learning, competencies and employability. The research design was based on a series of in-depth interviews with a cross-section of academic staff and employers. This was followed by a questionnaire survey to a sample of academic staff across the University. The larger number of factors identified by the survey was reduced to a smaller set of questions which was put to a selection of respondent. The Delphi approach was used to elicit their views and opinions about future directions of education in this field of study. The students themselves completed reflective learning statements and participated in a final group discussion. Findings show that industrial placements remain the main form of external work-based learning activities, environmental issue-based or otherwise. The main focus of the consultancy projects form of teaching and learning activity was in the School of Environment & Life Sciences and Information Services Institute. The research demonstrated that student employability is enhanced by embedding supportive knowledge-skills transfers into the teaching and learning process through the consultancy project approach. The paper discusses student reflections on their own learning, development of their competences and employers experiences with the approach. It therefore provides insights for considerations in developing this approach as a method of learning. The research demonstrated that student environmental education and their future employability are enhanced by embedding supportive knowledge-skills transfers into the teaching and learning process. This can be achieved through using environmental consultancy project approach teaching and learning.

3-2 Effective Environmental Education Program To Solve Social Dilemma

Hirohiko Suwa¹, Hitoshi Yamamoto², Isamu Okada³ and Toshizumi Ohta¹, (1) University of Electro-Communications; (2) Risho University; (3) Soka University

People may be aware of environmental problems but still not behave in ways that will solve them. What kind of educational program promotes environmentally responsible behavior? Since we have already found that the most influential factor promoting environmentally responsible behavior is cost consciousness, we hypothesized that the most effective educational program would be one fostering an understanding of social dilemmas. Testing this hypothesis in an experiment comparing a social dilemma program and an enlightenment program, we found that only the social dilemma education program increased cost consciousness and elicited environmentally responsible behavior. We therefore think that a social dilemma education program would promote environmentally responsible behavior better than an enlightenment education program would.

3-3 Environmental Education in Portugal: Appraisal and Perspectives on the Role of Non-scholar Organizations

Luisa Schmidt, Instituto de Ciencias Sociais da Unidversidade de Lisboa

Currently, there is no a seriously integrated program on environmental education in Portugal led by governmental agencies, but only disparate voluntary initiatives. However, several surveys had evidenced in the 1990's a growth of concerns by young people on environmental issues in Portugal, though people (even the youth) remained misinformed about and non-participative in civic actions on environmental issues. This means that environmental education in Portugal is being ineffective, since it does not account on the levels of people's literacy, which is in general very low for a wide part the population. It means also that systematic studying on the issue is lacking, in order to have deep information on the situation. The aim of this study is to identify, characterize, collect and systematize data on initiatives of environmental education in Portugal. The field seems to be characterized by wide spreading, diversity, and disperse voluntary action by non-governmental agents and self-mobilized teachers. In the context of the Decade Dedicated to Education for Sustainable Development of UNESCO, governmental and non-governmental organizations dedicated to the environment have now a new opportunity to enhance and co-ordinate contributions to make environmental issues a priority for next generations in the new millennium.

3-4 An Alternative Model of Environmental Education: The Experiences of Participatory Methodology Applied to the EPA in the Northern Coast the State of Bahia

Angelica Reboucas and Bartholomeu Reboucas, Universidade do Estado da Bahia, Brazil

This study discourses upon an alternative model of Environmental Education, already applied, which aims at the ecological sustainability of the EPA, The Environmental Protection Area (in Portuguese APA) in the Northern Coast of the State the Bahia, Brazil, a developing country in South America. The experience related presumes that such communities do not have skills, attitudes and careful disposition towards the environment. This is proved by the impacts already caused on flora, fauna, hydro and mineral resources as a consequence of the lack of due instruction through conventional education and the "alleged" necessity of struggle for life. It is evidenced that due to the fragility of regional environment, the area runs severe environmental risk. Large risks are identified with the implantation of modern hotels and resorts which increase transitory population. The action of the public company CONDER and its performance in the urban planning and environmental planning of the area is the salient point. The participative methodology utilized and a high dosage of sensitization of community involvement can secure continuous maintenance of concepts and represents an element of reality alteration. The Biocentric Education used by the authors is sensitization and applicable to educational processes, therefore recommended for the practice of environmental education. This paper evaluates the results of work experience and suggests its maintenance / amplification. Its expansion to other areas and countries is recommended.

3-5 The Role Of E-learning In Sustainable Development Of An Industry Through Online Education To Employees

Gnr Prasad and A. Vinaya Babu, CBIT, Gandipet, Hyderabad, India

The use of An Electronic Learning (E-learning) improves the sustainable development of industry through training for job holders. Always learning provides a substantial improvement to their current job when especially very limited range of learning opportunities is available. This, however, only holds true if respective training programmes meet the working environment and the professional context of officials in an optimum way:

The paper argues that education is perhaps the most important factor in improving quality in job and ensuring its sustainability. However, the educational systems of the many countries are developing leading to the importance of e-learning proves is most important.

The paper finds that:

- The widespread and growing availability of information and communication technologies and applications like eLearning can be used to accelerate online education.
- eLearning, in particular, is proving itself a major tool in learning activities of the many industries.
- eLearning addresses immediate educational needs and also the digital divide that is becoming an increasing concern in many industries.
- participants involved in eLearning programs gain much more than the subject matter knowledge contained in the lessons, they also become networked with other development professionals and have greater access to experience outside the region as well as strengthening their knowledge in their field.

3-6 Education of managers - factor of sustainable development - The Case of Russian firms in 2001 - 2004

Raimo Blom¹, Harri Melin², Alfred Sarno³ and Irina Sarno¹, (1) University of Tampere; (2) University of Turku; (3) St. Petersburg University of Economics and Finance

Within the framework of the project 'Managerial Strategies, Social capital and Trust among Russian Enterprises' our research group has carried out two representative surveys of Russian managers. The first survey was conducted in 2001; the total number of the surveyed managers was 1007. The second survey was implemented as a panel in 2003; the total number of the surveyed managers was 1005. In addition, 21 interviews with experts were conducted in 2004. The essential part of the received empirical data has been devoted to analyzing the influence of the educational practices of managers used nowadays on prevailing managerial strategies, including strategies focused on the maintenance of sustainable development. The study has shown that educational dynamics of Russian managers are determined by contradictory processes. At the same time, the significant part of transformation processes, occurring in the preparation system of managers, really initiates Russian firms to select more constructive managerial strategies. Due to this fact, the number of firms guided onto a strategy of sustainable development grows. Such preparation channels of managers as foreign business schools, and also the training of Russian managers in successful western companies make rather important contribution to this positive process.

4-1 The effects of urbanization on the intensity of the urban heat island: A case study on the city of Kuala Lumpur, Malaysia

Ilham S.M. Elsayed, Sudan University of Science and Technology

The study aims to find the effects of urbanization on the intensity of the urban heat island focusing on a case study done on the city of Kuala Lumpur (KL), Malaysia. The level of urbanization of the city depends solely on the population density of the city. While, two methodologies combined to study the urban heat island of the city; a combination of weather station networks method and traverses survey method.

The study shows that, there is an increase in the intensity of the Urban Heat Island (UHI) of the city of Kuala Lumpur since last similar studies done in 1985(Sham Sani 1990/1991) to this recent study in December 2004. The increase of the intensity of the UHI of the city is 1.5 o C. On the other hand, there is a gradual increase on the population density since 1980 to 2004.

Thus the intensity of the UHI of the city is directly proportional to population density of the city. Therefore, the study concludes that, as the level of urbanization on the city increases, the intensity of the UHI of the city increases.

4-2 Effect of Cover Materials on Heat and Mass Transfer Coefficients in Plastic Solar Still

Mahadeo Krishna Phadatare and Suresh Kant Verma, Institute of Technology and Engineering, A/P Malegaon (BK), Tal. Baramati, Dist-Pune, India

Due to industrialization and population rise the shortage of fresh water has become a sever problem worldwide. Desalination process is considered to be one of the simplest and widely adopted technique for converting seawater into fresh water. One of the main advantages of distillation process is that it requires heating water only up to 120° C, which can be supplied from solar energy. Solar energy is readily available on earth's surface. The conventional solar distillation process is more economical than other sea water distillation processes due to Eco-friendly cost-free energy, low operating cost, simple design, and unskilled manpower requirement. Plexiglas and glass of 3mm thickness were considered as covers for the two identical solar stills. Both the units were operated under the same meteorological and environmental parameters. The effect of cover materials on heat and mass transfer coefficients was compared under the same operational conditions. It was found that for water dept of 10 cm the plastic solar still with glass cover produced 30-35 % more than that of the plastic solar still with Plexiglas cover. This is due the

fact that the glass temperature falls rapidly than that of the Plexiglas temperature in the afternoon. The results are presented for a typical day Nov. 1, 2005 when the insolation was 800 W/m².

4-3 Indicators for Sustainability Assessment of Energy Systems -The RedImpact Project

Regina Eich¹, Wilhelm Kuckshinrichs¹, Werner von Lensa², Sven Tittelbach² and Tobias Bodewig², (1) Systems Analysis and Technology Evaluation (STE), Forschungszentrum Jülich GmbH, Germany; Institute for Safety Research and Reactor Technology (ISR), Forschungszentrum Jülich GmbH, Germany

Sustainability indicators take a crucial part in terms of operationalising Sustainable Development and in terms of decision-making towards a more sustainable future. For energy systems a lot of attempts had been started to take the challenge to define indicators and to create comprehensible indicator sets to operationalize the core concept of Sustainable Development. Although considerable efforts were undertaken, there was only little success to agree upon common Sustainable Development energy indicator sets. Not surprisingly, this reflects different aggregation levels of energy systems, different framework conditions and assumptions, as well as different political viewpoints and different systems of values.

For the definition of a set of Sustainability indicators it is necessary to use a sequence of single steps to guarantee on the one hand to base its set on current publications and activities, not focusing only on specific energy systems like nuclear energy, and to create on the other hand a set covering all relevant aspects, including nuclear-specific ones, for comparative Sustainability assessments of electricity generating technologies.

The RedImpact project operationalises the concept of Sustainable Development within the context of nuclear energy cycles. It is characteristic for these cycles to be connected with several ecological, economic and social impacts. For this reason, the consideration of nuclear energy cycles with regard to Sustainable Development is of particular interest. Being aware of technology competition between nuclear and non-nuclear electricity generating technologies, RedImpact supports the identification of Sustainable Development indicators and the creation of indicator sets for comparative assessment.

Therefore, the article discusses Sustainable Development indicator sets appropriate for nuclear as well as non-nuclear electricity generating technologies. Subsequently, an associated indicator set is represented which takes into account holistic characteristics of nuclear energy cycles as well as the complex multi-level network of producers and stakeholders. Consequently, the indicator set can act as a basis for sustainability-orientated recommendations in different decision-making contexts.

4-4 Sources of Fine Particle Air Pollution in Several Major Cities in China

Mei Zheng¹, James J. Schauer², Mike H. Bergin¹, Lynn Salmon³ and Gayle S. W. Hagler¹, (1) Georgia Institute of Technology; (2) University of Wisconsin; (3) California Institute of Technology

Fine particles (PM_{2.5}) suspended in the atmosphere are associated with haze that reduces visibility and adverse health effects, as shown by increased hospital admissions and emergency room visits. Unlike the US, China has not regulated PM_{2.5} yet. The rapid economic growth in the past few decades in China has resulted in high levels of fine particulate matter. This paper aims to investigate the major sources and characteristics of fine particles in one or more cities in the northern China (Beijing) and the southern China (Guangzhou and Hong Kong). Using chemical tracers and atmospheric modeling, the major sources of particulate air pollution including diesel engine exhaust, gasoline engine exhaust, coal combustion, and biomass burning in these cities are quantitatively assessed and compared. Some sources such as coal combustion and biomass burning exhibit distinct seasonal variations with increased impact in winter. The detailed investigation of chemical properties of fine particles provides critical information of PM_{2.5} sources which is necessary for effective air quality management strategies.

5-1 Inverting sustainable development? - Rethinking ecology, innovation and spatial limits

Rasmus A. Karlsson, Department of Political Science, Lund University

Over the years, two strands of thought on sustainable development have emerged, often identified as ecologism and environmentalism respectively. Ecologism, or deep-ecology, seeks drastic political action to restore our relationship with the non-human natural world while environmentalism, covering different theories of ecological modernization, argues for a more managerial approach to environmental problems. The two strands differ on ontological assumptions, risk assessments and remedial strategies, thus creating a whole spectrum ranging from urgent calls for de-modernization to neoclassical hope of infinite growth. This article suggests that there exists a third rhetorically excluded option, namely large-scale industrial expansion into space. Access to raw materials found on the moon as well as unfiltered solar energy would dramatically increase the stock of resources and energy while providing unlimited sinks for pollutants; thus satisfying two of the determining factors of sustainability. Given the uncertainty of estimating the planet's ecological carrying capacity as billions of new consumers are integrated into the global market, space industrialization can be seen as a novel way of interpreting the precautionary principle. Traditionally, the dilemma of resource scarcity has been a concern for environmentalists calling for a reduction of energy and material flows. Correspondingly, the promise of space exploration has been limited to technological optimists whose economic framework rarely acknowledges any such scarcity. By reconciling the politics of scarcity with technological optimism, this article evaluates democratic, economic and psychological aspects of space industrialization.

5-2 The Competitive Global City 2030: A Futures Approach

Patricia Ruth Kelly, John Stanyon Ratcliffe, Julie Noelle Gannon, The Futures Academy, Faculty of the Built Environment, Dublin Institute of Technology, Ireland

In an increasingly globalising and competitive world, cities are facing unparalleled challenges relating to such forces as economic restructuring and fiscal stress, national security, institutional relationships and the changing role of governance, environmental degradation, social and cultural transformation and rising exclusion. In May 2005, The Futures Academy, Dublin Institute of Technology, in collaboration with the Urban Land Institute (ULI), embarked on a joint initiative to stimulate thinking and encourage informed discussions concerning the future trajectory and sustainable development of the competitive 'global city'. As part of this study, The Academy undertook in-depth background research including a comprehensive questionnaire survey; an interactive and participatory futures brainstorming workshop; and roundtable discussions addressing emerging concepts, challenges and uncertainties surrounding the 'global city' debate. This paper sets out the findings of this investigation and provides a contextual background of the challenges, driving forces, issues and trends shaping the evolution of the global city in the next twenty-five years. The paper discusses how issues such as liveability, economic and demographic changes, the environment and civic leadership will influence cities and elucidates how cities might position themselves in order to move towards a sustainable urban future.

5-3 Meta-game-based Scenario Analysis: Case Study of Tokyo Regional Transport Planning

Hironori Kato, Hideaki Shiroyama and Yoshinori Nakagawa, University of Tokyo

In general, to set up appropriate scenarios is essential for proper implementation of public policy. This paper proposes a method to generate future scenarios with an analysis on the reciprocal expectation of stakeholders and applies it to a case of regional transport planning. Chapter 2 introduces the problem structuring method proposed by Kato et al. (2005). We analyze an interaction among stakeholders based on the revised cognitive maps illustrated based on the additional interviews. Chapter 3 presents a method of generating future scenarios. We focus on the meta-game among key stakeholders. First we list up key stakeholders. Second we examine the feasible options of key stakeholders and then consider the combinations of their options. Third, we examine the feasibility of combined options based on the stakeholders' reciprocal expectation to find out a solution with the Pareto improvement. Fourth, we choose a social value for selecting options. This social value is derived from a social ethical viewpoint. Fifth, we select scenarios by comparing the expected social values of options. Then, we demonstrate an empirical application of the proposed method to the case of regional transport planning of the Tokyo Metropolitan Area. Finally, Chapter 4 concludes the paper and discusses future research.

5-4 The Application of Methodologies to more Effective Product Design

L. N. Green, The University of New South Wales, Sydney, Australia

The teaching of product design is usually conducted in an Industrial Design Studio where students undertake projects under the direction of a studio director. In the third year of the program a typical industry-cooperative studio project is often used to pull together the complex interactions, associated with meeting product requirements in terms of user satisfaction and issues associated with sustainability and marketability. This summation of interactions has proved to be extremely difficult for students to comprehend because of the complex trade-offs between considerations of the consumer, the client, usability and sustainability. It is proposed that the introduction of design methods to the teaching and learning process would be helpful in providing a structure upon which design decision making could be based and make more apparent and transparent the overall thinking associated with the design process. This paper proposes and explores the application of design methods to the process of product design as part of a studio design project with the objective of improving the quality of the product design.

6-1 Ecological Impacts of Secondary Coastal Roadways

Xiong-zhi Xue, Xiu-li Cao and Serif Basoglu, Xiamen University

This article briefly outlines possible approaches, methods and techniques for evaluation of environmental impacts of coastal roads, particularly focusing on secondary and schedule roads within "coastal bend". It also describes the major pre- and post- ante effects of coastal roads on living and non-living natural resources and suggests ways to impact management within a holistic framework.

The high concentration of people in these coastal bend regions has produced many economic benefits, including improved transportation links, industrial and urban development, revenue from tourism and fisheries. On the other hand, the combined-ripple effects of booming population growth and economic technological development and not only creating coastal mushrooming cities and transit communities, but also they are threatening the ecosystems that provide these economic benefits.

The approach taken in this study is to identify known hypothesis road-related issues and to outline the scientific interaction available about them. Generalizations are made where appropriate, however, roads issues separated from the specific ecologic, economic, social, and construction management context in which roads are exist or are proposed.

Systematic examination and understanding of the existing and potential "sector" interactions, which affect different activities and resources in the coastal bend, and identification of the costs and the benefits of activities that take

into account their beneficial and harmful effects on other activities that will promote sustainable development in the coastal area as a whole are discussed.

Based on the previous studies and the assumption that intensity is the net difference between positive and negative interactions having a "function value" onto ecosystem and the degree of the impact is the dependent variable of this function value, some symbolic and formulas to evaluate the ecological impacts caused by the coastal roadway(s) were suggested.

6-2 Ecological Footprinting in UK Local Government: closing the 'science-policy' gap

Andrea Collins, Cardiff University, UK

In the United Kingdom (UK) there has been increasing interest in the ecological footprint as an indicator of sustainability, particularly amongst local government. This paper provides for the first time, a critical analysis of the way in which ecological footprint studies have been undertaken for local government and the extent to which they have been able to use their results to inform policy decisions relating to sustainability. This paper begins by explaining how the Ecological Footprint concept has developed in the UK since the late 1990's. The second section reports on the experiences of local governments that commissioned studies between 1999 and 2003, and how their organisation has responded to and used their footprint results. This section will also highlight the 'science-policy gap' that has been found to exist between ecological footprint results and the ability of local government policy officers to use them to inform policy decisions relating to sustainable development. Following this, the paper describes how an Ecological Footprint has been developed for Cardiff, the capital city of Wales. The approach used for undertaking the Ecological Footprint for Cardiff has been significantly different to that which has been used elsewhere in the UK as it has involved a unique process of gain the necessary political buy-in and corporate support for the study and a unique consortium of researchers at Cardiff University and Council policy officers checking the quality of data used in the Footprint calculation. The paper concludes with those steps that need to be taken before local government policy officers can begin to use the footprint as an evidence-based policy tool for sustainability decision making.

6-3 Development of Metabolism Accounting Methods for Sustainability Monitoring in Settlements - Ecological Footprint as a Comparative Measurement Tool

Foley Walter, Richard Moles, Bernadette O'Regan, Centre for Environmental Research, University of Limerick

An Environmental Protection Agency (EPA) funded ERTDI (Environmental Research Technological Development and Innovation) study of 79 settlements commenced on 1st March 2002. It was proposed in part to achieve metabolism accounting of material flow networks within and between settlements. Metabolism accounting is a systematic assessment of the flows and stocks of material within a system defined in space and time. The metabolism of most 'modern' settlements is essentially linear, with resources flowing through the urban system. It seems unlikely that the planet can continue to accommodate an urbanised humanity, which routinely draws its resources from a distant hinterland. The basis for this research on material and energy flow is that it can help develop a circular pattern of urban metabolism vital to sustainable development. For the development of material, energy and waste oriented policies, knowledge about the flow, use and disposal of materials through society is necessary. Data were collected for selected settlements from a 79 settlement sample. Identification of data required and data available, and the means of gaining information both necessary and valuable but currently not available were fundamental tasks of this research. Ecological Footprint's were then calculated depending on the degree of privileged information for specific settlements. The research has helped identify critical parameters in settlement sustainability in Ireland with special attention to the importance of size, functionality, geographic location and place in the spatial hierarchy. The research will allow the development of effective, practical recommendations regarding the integration of sustainability goals into Irish settlement planning.

6-4 Taiwan's Ecological Footprint: From 1994 to 2003

Yung-Jaan Lee, Meng-Fang Wu and Shih-Jian Lin, Graduate Institute of Architecture and Urban Planning, Chinese Culture University

In the 2005 Environmental Sustainability Index (ESI) ranking, Taiwan performed poorly. The poor ranking suggests that developments in Taiwan have caused unsustainable results. However, the poor ranking could be due to the lack of information or the difference of statistical base. On the ESI report, Ecological Footprint (EF) analysis is the 27th variable. In the ESI report, Taiwan's EF is 4.67 hectares per person, which is twice as the world average. The calculation of Taiwan's EF was based on 1997 statistical data and did not consider the "equivalence factor", resulting distorted EF. Therefore, this study reviews recent literature and latest theories and renews Taiwan's EF based on 10-year data sets and the equivalence factor. The result of the 10-year EF calculation shows a steady growth trend, from 4.74 hectares in 1994 to 4.96 hectares in 2003. After the modification of the equivalence factor, the EF in 2003 reached 5.14 hectares. If the Ecological Benchmark (EB) is 2.0 hectares, then the Ecological Deficit (ED) reaches 3.14 hectares. The results indicate that the unsustainable trend is obvious in Taiwan. While considering the implementation of sustainable development, how to reduce the expansion of EF becomes an urgent issue.

6-5 Urbanization Quantified by Ecological Footprint

Liang Chen, Zhao Honglin, Chen Donghui, School of Environmental Science and Engineering, Donghua University

Ecological Footprint(EF) is a new prevailing method to quantify the stress on natural ecosystems from human activities. EF can quantify the pressure and effect of urban economic activities on natural ecosystems. In this paper, both of EF and ecological carrying capacity(EC) for Qingpu district in Shanghai located in the east of China from 2002 to 2004 were estimated. The capacity is 0.141 per capita in 2004, while the EF increases from 2.312 per capita in 2002 to 2.441 per capita in 2004. The results indicate that the ecological deficit and the regional ecological pressure of Qingpu district are gradually getting larger and larger. It is concluded that the urbanization does change the structure and function of the ecological system and turns the balance between the loading and the support to large need from outside.

6-6 The Xiamen Regional Sand Management, Environmental Impact And Assessment Project

Serif Basoglu¹, Huai yan Lei¹, Zhan rong Guo¹, Yuezhong Shi¹, Mark Luo¹ and Xiuli Cao², (1) State Key Laboratory of Marine Environmental Sciences, College of Oceanography and Environmental Sciences, Xiamen University; (2) Environmental Science of Ministry of Education, Ministry of Education Environmental Science Research Center, Xiamen University

This report is part of the ongoing research of "The Xiamen Regional Sand Management, Environmental Impact and Assessment Project, (RSM/Xiamen)". The project fosters besides the more balanced and sustainable natural system processes, reduced project costs, and achieves greater regional benefits, and also to identify and prioritize regional sediment management needs and opportunities along the Xiamen coast, and to make this information available to resource managers and the general public to assist in addressing coastal sediment management issues.

As a part of this project, in this article we aim to provide insight into the problems Xiamen's eastern shorezone, thereby providing a basis for evaluating the impacts of natural events and human intervention. The specific focus is to monitor the fate of beach component included semi-annual profiling on transects and periodical beach width measurements of the certain sites within the context of the RSM/Xiamen. Under the scope of quantitative and qualitative evaluation of the data, we discuss the principal findings with regard to steadily eroding components, and probable adverse human impacts on the study site, and to help separate human-induced changes in the littoral cell.

Furthermore we also discuss sediment management and beach nourishment activities, and possibilities of habitat restoration and protection for the certain compartments of the eastern Xiamen beaches.

7-1 Public-Private Partnerships for Municipal Solid Waste Management Projects

Torsten Kleiss, Bauhaus University Weimar, Chair of Construction Economics, Germany

Effective provision of solid waste management is an important component of sustainable municipal development. In the past, municipal solid waste management was predominantly provided by the public sector, whereas nowadays more and more long-term Public-Private Partnerships (PPPs) are applied for its provision. The aim of these PPPs is to combine resources from public and private stakeholders to ensure the effective provision of physical infrastructure. Apart from municipal solid waste management, different organisational and legal models of PPPs have already been implemented in different infrastructure sectors around the world. Based on a quantitative survey in Germany and Japan, this paper discusses the application of long term PPP models for (1) incineration projects and (2) mechanical-biological treatment projects (including the integration of waste-to-energy). These project types were selected for analysis, because they have become the most important end-of-pipe technologies for residual waste treatment in developed as well as many developing environments and because they require large amounts of capital investments. Two representative case studies from Germany and Japan will be presented to exemplify the two internationally most commonly applied PPP models for incineration and mechanicalbiological treatment projects - (1.) Build-Operate-Transfer (BOT), and (2.) Joint Ventures. Based on an integrated risk management analysis, their organisational and financial structures, procurement processes and incentive mechanisms will be illustrated. A discussion on the impact of Public-Private Partnerships on the sustainability of municipal solid waste management will conclude the research paper. Annotation: This research has been supported by the Japan Society for Promotion of Science (JSPS) and the EU-Asia-Link Programme.

7-2 Liberalisation of municipal waste handling - compatible with sustainable practices?

Ole Busck, Aalborg University

Outsourcing and competitive tender of waste collection in Danish municipalities is framed by a complex of ideologies, objectives and considerations as well as regulation. Both in the EU and at national governmental level extreme demands for marketization of the public sector have been balanced by social and environmental considerations associated with the superior goal of sustainability. When a public service is contracted to a private provider the competence to define qualitative requirements is left with the municipalities. Waste collection has been the public service most outsourced in Denmark since the EU guidelines on public procurement entered into force. In this respect Denmark is leading in Europe. A recent study shows that this has led to a deterioration of the working conditions of the employees with implications for the environmental quality as well, questioning the institutional framework of outsourcing and competitive tender. Following an outline of the normative and regulative framework and the general tendencies in outsourcing and competitive tendering of public waste collection through the last 20 years, the paper identifies the main dynamics in the process of outsourcing public services in general

and waste collection in particular. Finally, assuming that outsourcing not *per se* leads to less sustainability and that the institutional context is crucial, the present reality in the waste collection sector is analyzed institutionally and some central means to influence the institutional context discussed.

7-3 A Semi-Centralised Infrastructure Systems - Integrated Systems for a Sustainable Development of Fast Growing Urban Areas

Hans Reiner Boehm, Susanne Bieker, Alexandra Selz, Section Environmental and Spatial Planning, Institute WAR, University of Technology, Germany

Many cities are confronted with environmental problems. Therefore sustainability – in ecological, economical and social terms – has to be considered in urbanisation processes. Among other aspects a call for action exists regarding the future design of water supply, wastewater treatment and waste management in particular as well as spatial and infrastructural planning in general.

Integrated and semi-centralised supply and disposal systems, which are flexible adaptable to local parameters, may be a basis for sustainable urban development.

Their well adapted design and implementation may be possible by integrating the technologies for waste and wastewater treatment as well as water supply. To enhance their feasibility technical and non-technical (spatial) planning processes have to be integrated.

Integrated semi-centralised infrastructure systems are not yet developed and concepts for infrastructure planning as an integral part of comprehensive urban planning only exist in approaches.

The Institute WAR is conducting the research project "Semi-centralised supply and disposal systems for urban areas in China", aiming the implementation of integrated, semi-centralised supply and disposal systems in pilot projects in rapidly growing urban areas in China. First outcomes may be presented during the congress, including suggestions for innovative infrastructure planning as an essential part of comprehensive planning and urban development.

7-4 Practice of Zero Waste in Taiwan-Implementation of Mandatory Garbage Sorting

Chih-Ku Chen, Hsiao-Chin Cheng and Fan-Jung Meng, Sustainable Environment Engineering Consultants Co. Ltd

The Mandatory Garbage Sorting (MGS) enforcement provides the infrastructure in achieving zero waste goal because of intensive linkage between the public set-out behavior and the collection system. Starting from January 1, 2005, the First Stages Implementation involved 10 main cities in Taiwan and the nationwide enforcement was started from the January 1, 2006. The on-site investigation shows that averagely 81.9% trash bags are set-out under GS requirements (set-out by recyclable, kitchen waste and non-recyclable MSW) and thus results 10.5% MSW volume reduction rate. Moreover, the volume of recyclable and kitchen waste increases 29.5% and 64.8% that compares with the same previous period. The unique real-time set out action is observed as the key mechanism for the success of MGS enforcement. It was proposed initially to maintain MSW collection point hygiene and offers the chance MSW collection crew needed to inspect set-out trash bag in MGS implementation. To reduce further Material Recovery Facilities (MRFs) operational pressure, the real-time setout action also provides the fundamental in progressing the recyclable collection from single-stream recycling into double-stream collection.

8-1 Sick of the Traffic: exploring the urban design, transport and health nexus

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There is increasing understanding and acceptance among researchers and policymakers that the low density, heavily zoned, automobile dependent urban forms found in Australia and North America, are no longer sustainable. A growing aspect of the reform agenda is the adverse health effects of excessive car use. In Perth, Western Australia the State Government has responded to the problems of sprawl with its "Liveable Neighbourhoods" design code, which is intended to facilitate a more sustainable form of urban development. Liveable neighbourhoods are designed to be walkable environments, where housing is centred round services and facilities, and public transport routes. Conventional neighbourhoods are characterised by lower densities, segregated zoning and priority for private vehicles. This paper describes the Sustainable Transport and Health study being conducted in Perth comparing the travel behaviour characteristics and environmental quality between a sample of both 'liveable' and 'conventional' estates and relating these to selected personal health indicators in order to explore possible linkages. It describes the surveys, observations and focus groups being undertaken and how these will be combined to answer questions about whether the "Liveable Neighbourhoods" design code is making a measurable difference to transport behaviour and health outcomes and the overall transport sustainability of Perth's suburbs. The Sustainable Transport and Health study is part of the RESIDential Environments Project (RESIDE) based at The University of Western Australia, a longitudinal project which aims to the impact on walking, cycling and sense of community of neighbourhoods designed using liveable and conventional sub-division design codes.

8-2 Sustainable urban mobility in Europe and in Asia

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The main aim of this paper is to analyse the mobility system by taking into account the current issues and the possible tools which can be used to improve the efficiency of transport services and to recover the sustainable urban mobility culture.

In the first part of the paper a framework of the demand for mobility and of transport supply in Europe is presented to give an idea of the phenomenon. In particular, critical points - which characterise current mobility policies and planning interventions for modifying the individual demand for mobility - are analysed.

The second part of the paper deals with the case of Hong Kong, as an excellent example of public transport. This gives an idea on how transport services are organised in an extremely dense city, where public transport is the dominant transport mode.

Therefore, this paper provides, on one side, a framework of the current situation of transport by highlighting the strategic role of new tools - especially those of demand management - and, on the other side, detects the action lines which may be adopted in order to make the transport activity more sustainable by, for example, the support of modern services based on modal choices which generate fewer negative externalities.

8-3 A Study on Urban Ecological Traffic Planning in China

Yaping Zhang and Yuhui Zuo, Environment Department, Nanjing University, China

As the ideal city pattern of sustainable city, Ecopolis has become the trend of city development of the fourth generation in the 21st century. The construction of Ecopolis is flourishing in China. Since reform and open-up, urban traffic construction has made great progress but still is facing serious social and environmental problems with the accelerating urbanization. Ecological traffic system is one of the key tasks in Ecopolis construction. Through analyzing major traffic problems of Chinese cities, the concept and content of ecological traffic was defined and summarized. Five-law-in-a-whole pattern and principles of sustainable development, humanism and integration of ecological traffic planning were put forward in this paper. We established the target system of urban ecological traffic planning and gave several suggestions on China's urban ecological traffic planning.

9-1 Planning of Al-Subiya New City, Kuwait

Ali Muhammad Khuraibet and Faten Al-Attar, Academic: College of Health Science, PAAET and Private: ECO Environmental Consultants

State of Kuwait was established at the beginning of the 16th century. The early settlers settled around the southern part of Kuwait Bay. The city expanded in an oval shape and was bounded by a protective wall that acted as defence wall against attacks by tribes. It was only in 1952 that the fast growing country, due to oil exploration, export and revenues, needed proper planning and organisation. And in 1952 the first master plan was introduced by a British company; and the city expanded beyond the boundary of its defence wall. And as the oil revenues and population increased; new master plans were introduced in 1977, 1983 and 2004. The 1983 master plan indicated the need for the establishing of two new cities i.e. one in the north (Al-Subiya City) and one in the south (Al-Khiran City). In 2004 the environmental planning and feasibility studies begun for Al-Subiya New City, which is being carried-out currently by an Australian Company. The new city will be located along the northern part of Kuwait Bay. The bay is known to be ecologically sensitive and contain a wide range of bio-diverse marine ecosystems. The whole land and coastal strip of Al-Subiya is a virgin land and strip i.e. no development on it. There are historical remain that dates back to the Bronze Age west of Al-Subiya. Therefore, protecting the environment was a major significant issue. This paper highlights the scientific approaches and methodologies that were used to plan the new city in a very sustainable way. This was achieved by looking at the impacts of proposed activities such as highways, industrial areas, harbours, existing power lines pylons, construction of commercial and residential areas on Al-Subiya land and the mitigation measures that need to be taken and how environmental planning can reduce the impacts on the environment and sustain development.

9-2 Integrating Environmental Considerations into Urban Redevelopment Projects: An Analysis of the Environmental, Economic, and Public Health Benefits of the 22@ Project in Barcelona, Spain

Robin Charlotte Ried, J. William Fulbright Scholarship, United States Department of State

This report determines if the 22@ Project in Barcelona, Spain may be used as a model for ecologically responsible urban redevelopment. The report considers the model successful if it is able to maximize environmental, financial, and health benefits created by integrating environmentally responsible planning practices in urban redevelopment projects. In order to establish if Barcelona is a model it analyzes the Barcelona City Planning Department's efforts to incorporate environmentally responsible planning practices into the land-use reclassification, infrastructural renovation, and street network reconfiguration processes. Although this report determines that the 22@ Project is not an ideal model, it highlights several environmentally responsible practices in the Project that may be valuable in planning for other local, regional, national, or international projects. It offers practical and feasible suggestions for the improvement of the 22@ Project and sites how it may serve as a starting point for Barcelona and other cities to improve the environment, the urban economy, and public health. The report concludes that the creation of an international ecologically -based planning standard based on the compilation of best available environmentally responsible planning practices would encourage cities throughout the world to undertake environmentally responsible urban redevelopment projects and aid in their efforts.

9-3 Cities, Sustainability and Industrialization in China: A Case Study from Zhengzhou City, Henan Province

Dongyong Zhang, Uma Kambhampati, Stephen Morse, University of Reading

Following experience elsewhere in the world, China has pinned its hopes for development on industrialization and China's economy has grown exceptionally fast in the last two decades. However, this has generated unintended social and environmental consequences. The trade-offs between the benefits and negative impacts of such growth are now at the centre of discussions. This paper presents findings from research conducted in Zhengzhou City, China, designed to explore the diverse impacts of industrialization, especially in city level, urban setting. We focus on a large state-owned company White Dove Cooperation (WDC). We analyse the views of different stakeholders regarding the impacts of industrialization in general and WDC in particular and explore what are the impacts and whether there is a consensus among these stakeholders. Further more we consider whether on balance, these stakeholders perceive that the benefits from WDC outweigh its environmental and other costs. Finally secondary data are employed to examine the survey results. Our results clearly indicate that the characteristics of the stakeholders, as well as their positions in the local economy, make a significant difference to their perception of the impact of industrialization, and sustainable industrialization is of particular importance to the sustainability of a region, so as to reinforce an epistemology of sustainability as a socially constructed term.

9-4 Conceptual Framework for a Sustainability Assessment Model for Urban Renewal Projects

Grace K. L. Lee and Edwin H.W. Chan, The Hong Kong Polytechnic University

Statistical data from the Hong Kong Government indicates that the problem of local building deterioration is becoming worse. Over the years, the Government has implemented different urban renewal programmes to improve the built environment. Those measures partially enhance the physical conditions of the urban areas but at the same time they generate other adverse impacts on local communities. In order to ensure that urban renewal projects can address various urban problems simultaneously, researchers and the Government have stipulated a sustainable urban renewal approach that is to integrate sustainability concepts into urban renewal process. This study aims to review the history of urban redevelopment in Hong Kong, highlight the problems associated with current renewal practices, suggest a conceptual framework for an assessment model to be used to increase the sustainability level of local urban renewal projects, and propose possible methodologies for deriving that model.

10-1 Engaging Hong Kong Businesses in Environmental Change: Drivers and Barriers

Stephen Siu Lun Tsang, Sonja Studer, Richard Welford and Peter Hills, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

Hong Kong's businesses have been slow to embrace environmental management principles, particularly in the SME sector. This article analyses key barriers and incentives to engaging Hong Kong businesses with voluntary environmental initiatives and compares their relevance for companies of different sizes. As in other countries, SMEs show a much lower uptake of such activities than larger companies. Their approach towards environmental management is predominantly reactive, and legislation remains the key driver for engaging them with environmental change. Inadequate government policy and support, societal attitudes and corporate culture all contribute significantly to the comparatively poor development of corporate environmental management among Hong Kong companies. As long as most SMEs regard voluntary environmental activities as costly and unnecessary 'extras' that endanger their competitiveness and detract resources from their core business without offering any tangible benefits, fundamental improvements in their environmental performance will be difficult to achieve.

10-2 The Financial Market as a Vehicle for Protecting Human Rights: On Shareholder Activism

Emma Sjostrom, SuRe Sustainability Research Group, Stockholm School of Economics

The financial market is increasingly becoming an arena for concerned investors to put pressure on corporations regarding issues such as environmental protection, respect for human rights, and occupational health and safety. In addition to private and institutional investors, civil society organisations are also using the financial market in order to achieve goals regarding environmental and social matters. But how can they do so, given their oftentimes different world-view, ideology and agenda as compared to the corporate ditto? The purpose of this paper is to explore and explain how civil society organisations are using the financial market to put pressure on corporations. The study focuses on human rights, which have become a corporate matter following the diffusion of power and accountability from nation states to the corporate sector. The paper includes two case studies. One highlights how Amnesty Business Group bought shares in twelve Swedish corporations as a way to pressure them to adopt a policy on human rights. The other explains how Friends of the Earth bought shares as well as sought to influence other shareholders in order to campaign against Balfour Beatty's involvement in a controversial dam project in Turkey. One of the main conclusions from this paper is that less powerful actors can achieve a sought-after change by translating the problem so that it fits the ideology of actors who do have power to resolve it.

10-3 Building a Sustainable Business in China's Small and Medium-sized Enterprises (SMES)

Jieqiong Yu¹ and Nigel Bell², (1) The Centre of Urban Planning and Environmental Management, The University of Hong Kong; (2) Centre for Environmental Policy, Imperial College London, UK

This paper takes a preliminary step to look into the complicated and dynamic environment for engaging China's SMEs in corporate sustainability. It aims to provide insight into how China's SMEs perceive and practice sustainability, and to explore key drivers and barriers behind their environmental and social engagement. Findings reveal an apparent contradiction in the current status of Chinese SMEs towards sustainability: a high level of concern vs. a low level of engagement. The most important motivator appears to be improving corporate image, followed by governmental legislation. While barriers hindering SMEs' sustainable engagement vary, predominant problems involve a lack of awareness and perception, insufficient financial resources and insufficient or ill-suited external support. Accordingly, the paper highlights three areas for China's SMEs' further improvements: education, communication and cooperation.

11-1 Resilience for Assessing Sustainable Urban Development

Ricardo Vieira¹, Sigrid Stagl², (1) Sustainability Research Institute, School of Earth and Environment, University of Leeds, (2) SPRU, Freeman Centre, University of Sussex

It has become widely accepted that policies need to be based on sustainable development principles, which need to be translated into actions that take into account local specificity and social dynamics.

In this paper we are concerned with how societies change, and how can we assess this capacity of change. This leads to the resilience concept. We describe adaptability, resilience, multiple scales and multiple speeds concepts, and apply them to the variables: changes in diet habits; and water management, suggesting how to measure change, and thus the systems' resilience.

The result was the identification of areas where some indicators should be defined. Current indicators are not focused in understanding the "why" people behave in such a way that creates social-ecological problems. We defend that new indicators should focus on the understanding of why people have certain habits; and in a more accurate definition and analysis of what are the preferable states one would like to achieve. Furthermore, we defend the focus on indicators to evaluate the capacity of response.

Resilience allows the definition of change-orientated indicators, which are crucial when dealing with complex adaptive systems. These indicators are meant to complement rather to substitute state oriented indicators.

11-2 Complexity and Indicators of Sustainable Urban Development

Ricardo Vieira¹, Sigrid Stagl², Klaus Hubacek¹, (1) Sustainability Research Institute, School of Earth and Environment, University of Leeds, (2) SPRU, Freeman Centre, University of Sussex

It has become widely accepted that policies need to be based on principles of sustainable development principles and translated into actions that take into account the social and ecological dynamics.

There is evidence that urban areas can be thought of as complex systems (e.g. emergence of new properties, urban areas as open systems). The goal of this paper is to understand if it is possible to modify current indicators frameworks to capture the complexity of social-ecological systems. For this, we describe how the theory of complex systems can be applied to urban issues; discuss implications of this new theoretical framework to sets of indicators; assess the compatibility of the new EU framework DPSIR (Driving forces, Pressure, State, Impact, and Responses) with complex systems theory through the analysis of three case studies dealing with water quality issues, thus defining a set of indicators for the analysis of water quality problems in urban areas.

The DPSIR framework has proven to adequately capture the complexity of social-ecological systems. We reflected on some of the shortcomings and suggest modifications to the framework. This analysis shows that a shift on how indicators are used is necessary, and complex systems theory provides important insights on how to move into that direction.

11-3 A Methodological Framework for Indicators of Sustainable Development at the Regional Scale: The case of a Portuguese Region (Algarve)

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The development of indicators of sustainable development for regions is an emerging issue. Despite the high number of initiatives undertaken at national scale, there has been little work done for the interaction at national, regional and local levels. A methodological framework for indicators of sustainable development at regional scale was designed. The main goal of this approach – SIDS Algarve – is assessing and reporting regional sustainability performance. This work wants to contribute to public awareness and to encourage citizens participation. The framework aims the major dimensions of sustainable development: the economic (e.g. tourism being the main activity, with great economic impact, both regionally and nationally); the social (focusing on equity, education and health); the environmental (highlighting the subjects of coastal management and water resources availability and quality); and institutional (with governance and R&D as main concerns). The methodology is supported by a review of the sustainable development indicators worldwide with an identification of the benchmark indicator systems, followed by the selection of indicators conducted by experts from regional institutions. Public participation workshops were carried out in order to engage all key stakeholders. In this context, these sessions were designed to evaluate the set of indicators and support the selection of a subset of headline indicators. The case of a Southern region of Portugal (Algarve) is presented and usefulness of the methodology demonstrated.

11-4 Territorial analysis and Indicators: How to Measure the Sustainability of the Swiss Metropolitan Areas?

Christophe Mager, University of Lausanne

A diagnosis of the evolutions, in terms of sustainability, of the Swiss metropolitan areas since 1970 is made. The peripheric areas knew the most favorable, respectively the less unfavorable, evolutions, except for the economy. This situation is partly due to the urban sprawl: a growing number of households with a higher level of education and with children leave the city-centers and settle in the periphery. The less favorable economic evolution of the peripheric areas is to be put in relation to the fact that the post-fordist accumulation regime supports the return of the industries and of the services towards the densest zones.

12-1 Marketization Propelled Environmental Protection of Rivers in Rural Area

Wenqing Li, Xiyuan Wang, Wenying Liu, Dongmei Jiang, Lili Liu and Genfu Lu, School of the Environment, Nanjing University

The ultimate causation of rivers stagnation and dystrophication in rural areas was the rivers' public goods attribute, which made the use of rivers economic diseconomy and environmental diseconomy. In this paper, the resolvent of rivers' stagnation and dystrophication was combined with economy research. Four marketization models of rivers environmental protection and management were established, which respectively were "protect river by riverbank", "protect river by ponds along the river", "protect river by itself" and "protect river by glebes along the river". Thereby, the usufruct of rivers and related public lands was transparent. And the responsibility of rivers environmental protection was also unambiguous and transferred from the government to the contracted corporations or individuals. On the base of above, the paper took the Hanliu town of Yangzhou city in China for a demonstration analysis and the result showed that the investment profits rate of rivers environmental protection in Hanliu town was about 20 percent which was over the average capital profits rate of the world. Last but not least, the paper analysed all the benefits that the marketization of the river environmental protection brought, which included environmental and social benefits except economic benefits.

12-2 Nature Conservation policy in Bhutan

Chhewang Rinzin¹, Martin J. Wassen², Walter J. V. Vermeulen² and Pieter Glasbergen², (1) Royal Institute of Management, Bhutan; (2) Utrecht University

Bhutanese policies and laws pertaining to conservation have progressed since the Forest Act of 1969, from forest-based land management to sustained yield principles and approaches. The overall policy objectives of nature conservation are to integrate nature conservation and economic development plans to achieve a development that emphasizes management of nature conservation. This policy is guided by ingrained conservation values that prefer co-existence with nature to exploitation for economic gains. This value is reflected in the designation of over 26% of the total area of the country as protected areas and a further 9% as biological corridors. Furthermore, the government has also endorsed the policy of maintaining forest cover at 60%. The main purpose of this study was to assess the views of the local communities on the conservation policy of the government and see what drives them hold to such view. The information was collected by reviewing published and unpublished government documents and international journals. A field survey was also conducted, interviewing local communities residing in two nature conservation areas. Some 210 households were randomly selected. Results indicated there is full support for nature conservation (97%), in spite of strict rules (75%), restriction on use of timber and fuel wood (935), and loss of crops (73%) to wild animals. As a result, the tension needs to be resolved between the local communities, wildlife and the park management.

12-3 Waterfront and Coastal Environments: Competition or Complementarity? A Key Issues for Better Beach and Waterfront Management through Sustainable Conservation and Eco-tourism

Marcin Filip Jędrzejczak, Academy of Ecology & Management in Warsaw

As economic growth gave people more free time, since the 1950s coastal areas have become increasingly desirable holiday destinations, and coastal tourism has grown at an enormous rate, becoming a mass phenomenon. Although modern tourists are largely peaceful, tourism itself creates much damage to the environment. Nowadays large parts of coasts are subject to erosion, and natural beaches, which are pre-requisite for bathing tourism, are very rare. Most tourist resorts take artificial measures to preserve and extent beaches to improve their quality. Common feature is changing the natural coastal systems into "constructed interface or waterfront" between land and sea.

Limiting resource for development, tourism requires management and sustainable development strategies for beaches, dunes, and infrastructure, like development of pedestrian access and use of the shoreline. Qualitative and quantitative demands of tourists concerning the costal management have currently increased. Various components of the issue leads up to be considered, i.e. coastal users and their practical experience (spatial and temporal utilization, visitors perception and behavior), local authorities and their policies/projects, "access to the shore" policy, socio-economic and environmental characteristics, carrying capacity, Recreation Opportunities Spectrum, etc.

This paper focuses on adaptation of communities and populations along the coasts and it highlights good and bad practices of coastal management based on conflicts or complementarities between natural and human demands. It also intends to link biodiversity to tourist impacts, using both a descriptive and an experimental approach.

12-4 A Study on the Protection of Biyang Donkey and the Development of Regional Ecological Economy

Gao Fei¹, Dongmei Jiang² and Ren Jiuchang³, (1) Zhejiang University (2) Nanjing University and (3) Peking University

Biyang donkey, *Equus asinus* Linnaeus is one of the four famous fine strains of donkey in China, and also the unique local species originated in Henan Province. In the past few years, the population of Biyang donkey has been sharply decreasing. Based on the researches on its biological characters, population changes and the reasons of those changes, a series of protection countermeasures directed by sustainable development on Biyang Donkey are put forward, which may be new ideas for the ecological development and the protection of biological diversity.

12-5 Role of mangrove forests in sustaining lives and livelihoods of coastal communities

Ruchi Badola and S. A. Hussain, Wildlife Institute of India

The South Asian region is home to nearly half of the world's poor. Poverty in South Asia is inextricably linked to environmental degradation. The condition and management of ecosystem services is a dominant factor influencing prospects for reducing poverty. The present paper outlines the role of mangrove forests in the livelihoods of local people as well as in securing their lives and properties from storms and cyclones. It highlights these with the help of an empirical study conducted in the east coast of India that valued the key ecological services and direct use values provided by the mangrove forests. In this area local people are aware of and appreciate the contribution of mangroves in their lives and livelihoods and majority are in favor of mangrove restoration. The villagers feel that protection from storms and land erosion prevention are the primary functions of this ecosystem, followed by nutrient retention and export, fish production and provision of fuel, fodder and medicinal plants. Studies that link functions performed by natural ecosystem to human well being and security can help put conservation on the 'livelihoods' agenda of the local communities and resolve the classic battle of conservation vs development, as well as guide policy in sustaining these ecosystems

13-1 Removal of Barriers to Energy Efficiency in Catering Enterprises in Nairobi: Options for Nairobi City Council

Evans Kituyi and Carol Ochieng, Renewable Energy Technology Assistance Programme (RETAP), Kenya

Sub-Saharan African cities can significantly contribute to sustainable development agenda such as energy and environmental conservation, health protection and poverty reduction—hence the MDGs—through removal of barriers to investment in the micro and small enterprise sector. Nairobi city hosts thousands of small and micro-scale catering enterprises, most of which are temporary structures and illegal. They rely on charcoal and firewood though a few others use electricity, kerosene and LPG for their operations. Although they employ thousands of people and provide essential catering services for the city's workforce, the fuel consumption is unsustainable and poses severe implications for environment and human health. The study finds that prohibitive city by-laws and lack of clear investment guidelines for micro and small enterprises discourages investment in efficient woodfuel, kerosene and LPG cookstoves. Furthermore, the temporary nature of their businesses and frequent demolitions by the city council authorities does not endear them to available micro-credit opportunities. The Nairobi City Council could mainstream sustainability in the city's operations by developing and implementing appropriate policies and by-laws that would ensure right investment conditions are in place for micro-enterprise operations which would mitigate climate change and respiratory health, conserve energy and forests.

13-2 Zoning Implications on Sustainability in Jeddah, Saudi Arabia

Waleed Abdulaal, Department of Urban & Regional planning, King Abdulaziz University, Saudi Arabia

Recently Jeddah city proposed a new package of zoning regulations for the coming two decades as part of its structure plan. The latest zoning code features increasing density on existing built up area and allowing commercial uses along certain road categories. This paper aims at forecasting the potential implications of the suggested zoning ordinance on city sustainability to illustrate the efficiency of the likely resultant urban pattern affected, among other factors, by land use controls; namely zoning regulations.

13-3 Integrated Economic and Environmental Plans at National Level

Muawya Ahmed Hussein, Dhofar University, Sultanate of Oman

Throughout the world, there is a commitment by Governments to sustainable development, yet economic development continues to degrade the natural resources and pollute the environment in both urban and rural areas. Current thinking about sustainable development suggests that planners and development specialists should attempt to integrate social, economic, and environmental dimensions, at all planning levels. Integrated environmental and economic planning that considers both regional economic development and the environmental impacts of such development has rarely been used by governments to plan regional growth largely because of the absence of a methodology that would allow future environmental impacts of proposed development plans to be

quantified in monetary terms and used by Economists in their overall cost-benefit analysis of projects/sectors targeted for investment.

This paper examines the environmental dimensions in development plans undertaken by governments, especially in Arab countries (West Asia) and, evaluates one of the fifth year plans in Oman against the Millennium goal of sustainable development.

The study found that all governments often have common failings in including the environmental dimensions in development plans. To improve the integration planning approach, building on the common success factors and improving on the common weaknesses is proposed. An improved integrating planning approach at all levels may be pivotal in contributing to sustainable development.

13-4 Practice and Education - housing design and energy saving in Britain

Yun Gao, School of Art & Design, University of Huddersfield, UK

In the UK, two important energy saving legislations, namely, Part L of Building Regulations (2006 edition) and Code of Sustainable Homes, will both come into effect in April 2006. This paper is to investigate the massive impacts that these two pieces of new legislations will bring to the construction industry in England and Wales. Part L is a statutory requirement, which aims to lead architects and developers to improve energy savings in their decisions on housing design. Code of Sustainable Homes, based on current regulations, is to be marketed to the consumers of the housing market. It is intended that the generated motivations from potential home-owners will encourage architects and developers to reach higher energy saving designs. This paper will explore these two pieces of legislations respectively regarding to their forms, targets and potential influence. It will investigate the pressures and motivations they can generate among various parties in the construction industry in order to find new opportunities for promoting the energy efficient designs. The third part of the paper will briefly discuss the teaching of architectural designs with sustainable contents. It is important because the education will have great influence on the next generation of architects.

14-1 Global ecotourism opportunities: A missed opportunity for South Africa's ecotourism potentials and local economic development

Mokoko Piet Sebola, Tshwane University of Technology

Tourism has been globally identified as an industry that can reduce the increasing high level of unemployment and poverty reduction. In Africa, countries like Kenya, Zimbabwe and South Africa were identified with good ecotourism potentials that can attract more tourists favouring wildlife experience. South Africa was identified as a fast runner in ecotourism opportunities, and that could help it to attract more international tourists, especially considering years of being closed from the international community activities.

The success of South Africa in ecotourism opportunities will depend on its proper management of a transition from its previous tourism of isolation from the international community to a tourism opportunity opened to all races-domestic and international. Lack of focus by the previous governing system to explore the ecotourism potential of the Republic of South Africa and the past ecotourism politics compromised South Africa's ecotourism potential to contribute to local economic development to the rural South Africans.

This article, therefore investigates the ecotourism potential of the Republic of South Africa and the ecotourism politics which compromised the countries ecotourism potentials, in which the local economic development of the rural people failed to be realised

14-2 Ecotourism Priorities Study: Proactive Approach to Nature Conservation in Barangay Catigan, Toril, Davao City Philippines

Rowena Santos Delgado, University of the Philippines in Mindanao

Ecotourism was promoted in tourism in response to a growing need to create closer links to ethical values and principles towards sustainable development. Nevertheless, many ecotourism ventures have failed in ensuring environmental sustainability. As a result of the typical reactive rather than proactive planning agenda, planners end up as troubleshooters – desperately solving stanch environmental crimes, instead of averting them. The focus of this paper is on landowners' ecotourism priorities and factors that influence such priorities, based on a survey conducted among landowners of the case area, Barangay Catigan, Toril District, Davao City. While most studies involving environmental conservation attribute forest degradation and resource depletion to the lack of community involvement in favor of the bottom-up approach, the study reveals that the same populace is least likely to accept wider environmental concerns. Though Barangay Catigan generally meets the requirements for ecotourism initiatives, there is no evidence that ecotourism represents positive perceptions to most landowners in terms of social and environmental concerns. While landowners' priorities diverge to a large extent in terms of perceptions and expectations, convergences can occur in the level of envisioning and caring for the environment through expanding awareness of ecotourism principles and exploring approaches to effect positive change to the environment.

14-3 Bridging biodiversity and tourism towards sustainable development of sandy beaches

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Sandy beach biodiversity, and impact of tourism on biodiversity, is a subject currently generating great scientific interest in Europe. To meet the challenge of progressing ICZM and governance, baseline interdisciplinary research is required. Present understanding of the pressures exerted by tourism on beach biodiversity is difficult to apply. Baseline figures have been collected through surveys and questionnaires filled in by tourists. A study of the coastal ecology in the Baltic and Thyrrenian revealed a discrepancy between public perception, declarations, expressed will etc, and actual activity. Approximately 80% of the people surveyed answered that their ideal mode of recreation on the sandy shore was to have "long, undisturbed, secluded coastlines, to share only with birds and waves, rather than other people". Although the quest for isolation was overwhelming in the questionnaires, on-site study showed that 90% of tourists stay within 200m of the parking lot.

Today, wealthy tourists need facilities (roads, cars, services) to enjoy the safe distance, and they exploit indirectly the resources, most often in a very devastating way. This remark leaves us with a single question: what gaps are there in our knowledge of biodiversity (which includes humans and human ecology) that must be filled to allow us, tourists in our millions, to enjoy our holidays on beaches in a way that our living world can sustain? As to knowledge gaps, more sociological studies are needed about the relations of developed populations and nature/biodiversity.

This paper focuses on adaptation of communities and populations along the coasts and it highlights the need of common protocols and frequent exchanges between the partners of the research network on beaches. It also intends to sensitize public opinion about scientific and social issues connected to biodiversity in Europe, and to link biodiversity to tourist impacts, using both a descriptive and an experimental approach.

15-1 Is Democracy Sustainable?

Peter Wells, Cardiff University

Notwithstanding progress towards sustainability in terms of e.g. air quality, ecoefficiency, and recycling, attempts to achieve significant lasting change at local, national and international levels have foundered on the inability to gain agreement. Consensus between multiple stakeholders, while acceptable at a political level, increasingly seems inadequate to the task of creating sustainable societies. This paper explores the unthinkable, that liberal democracy is unable to deliver sustainable solutions. This is more than a philosophical contemplation, not least because if the mechanisms for solutions cannot be articulated then the space is created for totalitarian political responses: the creation of a Green Junta. The paper starts with a review of the reasons why drastic, rapid and dramatic change is needed. All the main indicators in terms of global warming, North-South imbalance, oil reserves, water resources, bio-diversity, de-forestation, population growth and rural-urban shift, globalisation, over-consumption and the distribution of wealth suggest a situation almost in free-fall. The second section then outlines the failure of global governance. The final, speculative, section considers the appeal that may arise from a 'strong government for a crowded planet' right-wing agenda. In the US there has been the emergence of new coalitions between the geo-strategists, the religious right, and extreme environmentalists uniting around the themes of energy security, anti-terrorism, and survivalism. The paper concludes that this appeal must be rebutted as a matter of urgency.

15-2 Private Governance of Low Impact Design Features: A comparative Investigation of Issues

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The private governance of sustainable design features, such as stormwater management and water recycling, is being promoted increasingly as part of new residential developments. This is an international phenomenon and a raft of management problems are emerging that require to be addressed. The location of these low impact urban features on private land where owners share collective responsibility for their management is regarded as a means by which local sustainability can be improved. At the same time, a reduction in ecological and economic costs of public infrastructure is intended. However, what is becoming apparent is that practice is moving rapidly ahead of law. Some critical issues are emerging about the maintenance, practicality and liabilities of these features. Achieving equity in the complex web of relationships and accountabilities in these situations requires a careful balance of public and private rights and responsibilities. This paper identifies and explores governance models in New Zealand, Australia, Canada and the United Kingdom. It compares relevant regulatory frameworks and key features of the legal entities that manage these environmentally sustainable features. It raises issues that need to be considered by policy makers and other stakeholders as these private arrangements become more commonplace.

15-3 Absence of Sustainable Governance for Health Crisis Management: the SARS Epidemic in Hong Kong

Dennis L.H. Hui and Mee Kam Ng, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

It has been recognised that public goods is a function of governance capacity. As demonstrated in the study of crisis management of SARS epidemic in Hong Kong however, the mode of governance presents problems that limit the capacity for public goods delivery. Indeed, crisis underlines the political failure to develop institutional capacity for preventing, managing and learning from crises. Although governance offers a mechanism for marshalling

resources for public management, it must attend to institutional orientations that provide appropriate guiding principles for it. The case study suggests that the crisis exposed the “thin” governance capacity in Hong Kong as clear cleavages can be found in governance relationships between WHO and China; the China mainland (particularly Guangdong) and Hong Kong; within Hong Kong among different sectors; and within the health sectors spanning government establishments, private sector and the civil society. These cleavages demonstrate the lack of institutional orientations between these relationships. This paper will also use sustainable development paradigm to examine possible ways of “thickening” governance and mend these cleavages of the highly compartmentalised health system in the city within a region of minimal administrative integration, thereby strengthening its crisis management capacity.

16-1 A material flow analysis of wood & paper in Cape Town: is there potential to redirect flows in formal and informal sectors to foster use as a renewable resource?

Christian Nissing and Harro von Blottnitz, Environmental & Process Systems Engineering Research Group, Chem. Eng. Dep., University of Cape Town

The City of Cape Town has recently drafted an energy strategy as well as an integrated waste management plan. The creative implementation of these strategies will, i.a., require knowledge of potential sources of energy and of regular flows of waste. Inventories of requisite data are either non-existent or sparse. Wood & paper is an interesting case in point, as it is both a significant contributor to waste and a potential energy carrier. A better knowledge of all related flows can be obtained by means of a material flow analysis, and presented in form of a ‘stocks and flows’ diagram. Data have been gathered and compiled for the formal and informal fuel wood sector, the formal manufacturing, construction and demolition sector, the informal construction sector, the pulp and paper market, the municipal solid waste management sector, as well as the wastewater treatment sector. Analysis shows that ~70% of the renewable energy target of the City of Cape Town (which aims for 10% of energy demand covered by renewable energies by 2020) could be met via the redirection of wood fibre based material flows within the Cape Metropolitan Area, and the utilisation of innovative transformation technology.

16-2 Wastewater Treatment in Microbial Fuel Cell and Electricity Generation: A Sustainable Approach

Makarand Madhao Ghangrekar and V. B. Shinde, Indian Institute of Technology Kharagpur, India

Application of microbial fuel cell (MFC) for wastewater treatment could be an attractive alternative to reduce the cost of treatment and generate electricity. Studies were conducted in the laboratory scale membrane less MFCs for treatment of synthetic wastewater. These MFCs performed well for COD and BOD removal from the wastewater, demonstrating the effectiveness of this device for wastewater treatment with COD and BOD removal efficiency about 90%. Using graphite electrodes, the electricity generation in these MFCs was observed under different MFC configuration and influent COD concentration. The maximum power density observed was 6.73 mW/m². Thus, power can be produced from membrane less MFC using organic matter from wastewater as source of energy. However, the electricity generation is lower, and further investigations are necessary to optimize power production.

16-3 Life-Cycle Resource Efficiency of Conventional and Alternative Water Supply Systems

Nalanie Mithraratne and Robert Vale, Landcare Research

Research on urban development to date has tended to focus on buildings, both individually and in groups, and less on the infrastructure that serves those buildings. Many detailed studies on life cycle energy and environmental impacts related to residential buildings have been carried out. However, these studies usually concentrate on the house itself without consideration of the infrastructure systems that are essential for the successful operation of the same. Water supply is one such system which has provided an efficient service in terms of traditional function but needs an alternative approach due to increasing demand for sustainable development, concern for limited resources and environmental impacts.

An objective analysis and quantification are essential to ascertain the sustainability of alternative options for water supply in comparison with conventional systems. Ideally, such an analysis should cover the complete useful life of the systems being considered. Life cycle studies of water supply systems so far have concentrated on performance improvement and have not considered the implications of the use of a particular system on residential development. This paper briefly examines the life cycle performance of reticulated water supply and rain tank systems used for urban residential developments in New Zealand. The analysis is based on life cycle energy, environmental impact and cost, using computer simulation.

17-1 Environmental Impacts for Restraining Motorized Traffic at the City Centre: A Case of the City of Yogyakarta, Indonesia

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The city centre of Yogyakarta, Indonesia is suffered from a severe congestion problem, decreasing air quality level and a declined economy. The city government has decided to gradually revitalize the city centre by introducing a pedestrian friendly area and traffic restraint for private motorized vehicles. The objective of the research is to investigate environmental impacts for introducing traffic restraint scheme. Using cordon charging between 10.5 – 21 US Cent and four simulation scenarios, the impacts of the area licensing were calculated. The results shows that

introducing area licensing schemes will increase network travel speed from 12.27 – 20.66 kph to 19.63 – 27.09 kph whereas the network volume to capacity ratio (VCR) improved from 0.65 – 0.80 to 0.44 – 0.70. The scheme will also reduce through traffic in the inner area between 23.73% - 13.10%. Those changes will be equivalent to USD 430,250 – USD 469,948 environmental benefit – making it an environmentally justifiable project. The research indicates that the project is both economically and environmentally feasible. The revenue generated from the scheme will also attract private investor and can be treated as public private partnership (PPP) scheme. Further work should be directed to establish institutional and legal frameworks for implementing the proposed project.

17-2 Environmental Reform and Technological Innovation in Hong Kong's Public Transport Sector

Jacqueline Chi Kei Lam, Peter Hills and Richard Welford, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

Drawing upon Ecological Modernization Theory (EMT), this chapter discusses the role of technological innovation in environmental reform in Hong Kong. Specifically, it evaluates the progress of technological innovation adoption in the public transport sector. We argue that large transport operators (i.e., franchised bus companies and railway operators) have been more proactive in the adoption of a wide range of environmental innovations. These include both new technologies and new environmental management practices. Awareness of potential competitive advantages and legitimation with societal stakeholders, represent two major drivers motivating large public transport operators to adopt technological environmental innovations (TEIs). This is in marked contrast with the position of small and medium-sized enterprise operators in the sector (i.e., taxi and mini-bus operators) who, because of financial, managerial, organizational, and technological constraints, possess only a limited capacity to engage in the adoption of TEIs. In the context of processes of environmental reform there is a need to strengthen ties between government and the public transport sector specifically to assist SME operators. We also argue that government needs to adopt a broader mix of policy instruments to encourage technological innovation among SME operators, especially learning-oriented mechanisms, rather than relying primarily on conventional regulatory instruments.

17-3 Institutional Change for Sustainable Urban Transport in Pakistan

Imran Muhammad and Nicholas Low, Urban Planning Department, Faculty of Architecture, Building and Planning, The University of Melbourne

It looks apparent that sustainable development cannot be achieved without addressing the institutional aspect of urban transport planning in developing countries. The institutional complexity is more obvious in the developing countries like Pakistan, where international institutional are playing a vital role for the provision of urban transport infrastructure, mainly conflicting with existing sustainable urban transport modes. In this paper the concept of path dependence is explored and extended to institutional, technical and discursive form of path dependence. The empirical focus of this paper is to identifying three form of path dependence in transport planning of Pakistan in general and Lahore in particular. The paper concluded that institutional change will require over urban transport policy domain for achieving sustainable development in Lahore, Pakistan.

18-1 Sustainable Development and Corporate Social Responsibility for Outsourced Manufacturing

Van V. Miller¹, Michael J. Pisani² and Jerry Bouth², (1) Human & Ecological Research; (2) Central Michigan University

In late 1965, Mexico re-launched an innovative project that was entitled the **Border Industrialization Program (BIP)**. This revamped project still had the same internal focus—develop via industrialization the northern border cities. However, its external focus switched from selling to a different region within Mexico to selling across the border to the United States. In the early years, the goods being sold were industrial components assembled from raw materials imported into Mexico and then re-exported, after assembly, to companies in the United States. Today, this type of fractionalized international manufacturing activity is called outsourcing, and the **BIP** represents one of the most successful North American endeavors at outsourcing. It has had its ups-and-downs over the years, but in 2005 there are approximately 2800 plants in the Program and 1.15 million workers within those plants. The term **BIP** is no longer used; instead, the plants and the Program are called maquilas or maquiladoras.

Maquilas, often located in industrial parks within or beside major Mexican urban areas, represent not only outsourcing but also export processing zones (EPZs). Worldwide, there are 50-60 million people employed in EPZs, which do and will have an impact on sustainable development. If we view sustainable development as the benefit/detriment that this generation causes for the next one, then how firms within EPZs treat their employees and the natural environment is a measure of their concern about sustainable development.

To study that concern within the EPZ context, we have chosen to analyze the activities, i.e. the self-proclaimed words and actions, of the Top 100 Mexican maquilas (www.maquilaportal.com). If any group of maquilas can afford to practice sustainable development, it should be this one with its large and well-funded maquiladora plants that are often owned by the world's largest corporations. Their activities have been scrutinized by examining their websites for indicators of sustainable-development practices, which have been categorized in terms of labor, human rights, and the natural environment. A fourth category denoting product quality is also measured in order to compare a standard and traditional production concern with the more recent concern for sustainable development.

To measure the importance that maquilas and their parent corporations attach to sustainable development, their website-reported activities have been evaluated as follows for each category. A score of no importance is assigned when there is no meaningful mention of the category. A score of low importance is attributed to the maquila when there is a relevant policy for the category. A score of moderate importance is assigned when there is a specific code in place for the category, and a score of high importance is designated when there is a performance measure revealed for the category. In addition, several control variables are measured for each of the maquilas.

Applying these measurements to the distinct categories of sustainable development, several hypotheses are then tested using non-parametric statistics. The first hypothesis looks at the geographic location of the corporate parent and specifies that European and Japanese maquilas will be more inclined toward sustainability than are U.S. maquilas. The second hypothesis tests the idea that product quality is more important to these maquilas than is sustainable development. The third hypothesis tests the contention that the natural environment matters more than human labor does.

In summary, the statistical tests on the data for the Top 100 maquilas reveal that sustainable development, as we have operationalized it, is more pronounced in non-U.S. maquilas, is not nearly as salient as product quality, and is itself divergent when the environment and labor variables are contrasted. The implications of these findings and the need for more research are discussed in the concluding section.

18-2 Corporate Social Responsibility And Environmental Management: Relationships, Development And Future Directions

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A growing number of organizations have made efforts to pay attention to their environmental management and corporate social responsibilities. Many such companies have demonstrated their willingness to work towards improving their environmental performance by implementing environmental management systems to reduce the impacts of their activities. Corporations continue to treat their environmental management systems and corporate social responsibilities separately. Yet corporate social responsibility it is a cluster concept which cover business ethics, corporate philanthropy, corporate citizenship, sustainability and environmental responsibility.

This paper seeks answers to questions concerning the future directions of corporate social responsibility and environmental management. The paper explores a number of issues concerning the future development path of each. It discusses the nature of their respective paths and considers whether they are diverging or converging into an integrated corporate response to organisational internal and external stakeholders. The method adopts a systematic literature review of the research literature to identify the future orientations of these areas of interest. Recent trends in corporate social responsibility and environmental management systems processes are identified and evaluated. The paper concludes by providing discussions concerning the linkages between these important elements of organisational responsibility with the context of sustainable development

18-3 Corporate social responsibility and sustainable development: A role for representative business networks?

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Sustainable development relies on complex interactions between the private and community sectors. In China the ability to foster public and private collaboration is essential in developing services required to deal with community social issues. This paper proposes that an effective form of business engagement in community health issues, leading to sustainable development, is through representative or peak business bodies, profiling an Australian & Chinese example.

AustCham Shanghai is a non profit membership based organisation strengthening Australia-China business and community relationships, fostering technical, cultural and community links and creating opportunities for Australian organisations to invest in the social development of Shanghai. Through a community outreach taskforce, the positive community approach builds on sharing membership knowledge and understanding human and cultural diversity. AustCham Shanghai offers opportunities for members to engage in and initiate community outreach activities.

The paper demonstrates how a networked approach to community investment allows individual businesses access to creative methods of community interaction, enabling them to take advantage of economies of scale for activity and expertise and knowledge within the group. It profiles how the industry or sectoral approach to supporting complex social issues contributes to sustainable development of business and society.

18-4 The challenges of government intervention in promoting corporate social responsibilities - insights for Hong Kong, Pearl River Delta and Asia region

Samuel Ka Yan Mak, Madison Communications

There is a global trend of increasing demand for the private sector to manage their business activities beyond the minimal legal standards. Advocates of Corporate Social Responsibility (CSR) argue that socially responsible business entities can gain competitive advantage while taking good care of the society and its environment where they operate. This growing CSR trend has attracted a lot of policy-makers and legislators in many industrialized

countries who are pushing for government intervention in various forms to control and persuade responsible corporate behaviour.

Yet, in liberal economies where government intervention is unattractive, additional CSR regulations can be unwelcome. Particularly for the Hong Kong SAR Government, whose guiding principles are based on minimal government and free economy, there is a delicate act of balancing for promoting CSR. Since big business and the challenges they face differ widely, government interventions need to be carefully considered, well-designed and targeted to achieve their objectives. Some challenges are even of regional / cross-border implications such as air pollution.

My paper aims to look at the challenges for governments intervening to promote CSR in Hong Kong and the neighbouring jurisdictions. I also want to look into regional differences in the Pearl River Delta and the role for international and regional instruments (such as OECD Guidelines for Enterprises, UN Compact, APEC and East Asia Summit)

19-1 Evaluation Model of Material Flow Analysis and Its Application in Tongling City, China

Yuan Wang, Jie Chen, Bei Zhang, Jun Tian and Genfa Lu, School of the Environment, Nanjing University

Fine particles (PM_{2.5}) suspended in the atmosphere are associated with haze that reduces visibility and adverse health effects, as shown by increased hospital admissions and emergency room visits. Unlike the US, China has not regulated PM_{2.5} yet. The rapid economic growth in the past few decades in China has resulted in high levels of fine particulate matter. This paper aims to investigate the major sources and characteristics of fine particles in one or more cities in the northern China (Beijing) and the southern China (Guangzhou and Hong Kong). Using chemical tracers and atmospheric modeling, the major sources of particulate air pollution including diesel engine exhaust, gasoline engine exhaust, coal combustion, and biomass burning in these cities are quantitatively assessed and compared. Some sources such as coal combustion and biomass burning exhibit distinct seasonal variations with increased impact in winter. The detailed investigation of chemical properties of fine particles provides critical information of PM_{2.5} sources which is necessary for effective air quality management strategies.

19-2 Design Support System for Sustainable Urban Development: Integrated framework of urban modeling, spatial-environmental analysis and decision-making

Simon Yanuar Putra¹, Andrea Peresthu² and Perry Pei-Ju Yang¹, (1) Singapore Millennium Foundation, National University of Singapore; (2) Faculty of Architecture, Delft University of Technology, The Netherlands

The rational approach of systematic and sustainable urban design process generally consists of three components, data collection, analysis, and synthesis, a tradition inspired by Geddesian dictum of survey – analyse – design (Geddes, 1949). In contemporary sustainable design practice, its media is still intuitive, traditional, iconic and analogue. Computer technology in traditional urban design practice only supports physical modelling and rendering visualisations, with little consideration of sustainable design approach. Advanced urban analyses had been developed using Geographic Information System (GIS) for supporting sustainable urban development. The methodological framework of planning support system for the issue of sustainable urban development has been discussed extensively. However, the focus on urban design decision support is still relatively to be elaborated. The idea of design support system (DSS) was inspired by the rapid development of decision support system (DSS) and planning support system (PSS) throughout various eras since 1960s. Sustainable urban development has been explored more extensively in urban planning discussion. To bring sustainability discussion from PSS approach, DSS still requires reassessments and transformations from urban planning paradigm to urban design framework. DSS requires deeper understanding of design-related issues, which should be assessed by a three-dimensional spatial and environmental analytical tool. A comprehensive framework of urban design methodology and strategy is pursued through extensive discussion of integrating urban modelling, spatial-environmental analysis, and design decision-making, for the development of future design support systems sustainable urban development.

19-3 Lessons Learned from GEF Project Development: Pedestrian and NMT Improvement Project for the City of Surabaya, Indonesia

Danang Parikesit, Togar Silaban, Novitarini Djarwoningrum, The Centre for Transportation and Logistics Studies, Gadjah Mada University

The Global Environment Facility (GEF) is a funding mechanism to assist developing countries to reduce global environmental problem. Under GEF Operational Program 11 (OP 11), the City of Surabaya plans to promote non-motorized travel and pedestrian facility at the city centre. The objective is to reduce GHG emitting modes of transport leading to the widespread transport-related measures on the protection of climate change. The project will connect residential area to business areas, tourism destinations, and Railway Station. The implementation of 10.2 Km of roads, development of safe crossings, intersection improvements, additional signals, and refuge islands will shift private motorized vehicles to non motorized modes for travel < 3 km. This will reduce the CO₂ emission by 1,476.75 ton, PM₁₀ and Pb concentration around 0.168 $\mu\text{g}/\text{m}^3$ and 0.00136 $\mu\text{g}/\text{m}^3$ in 5 (five) years. The success of the project will be dependent upon its ability to attract short distance travel to use NMT facilities. The GHG reduction impact should be complemented with improved air quality and health to obtain public support. Since NMT improvement requires long lead times to take effect, the policy framework for implementing GEF Project in transportation sector should allow more flexibility in estimating the additionality of the project.

19-4 Urban Development Research Based on Wuli-Shili-Renli Systems Methodology

Xiao-dong Kou, Hui-feng Xue, Lin Yang, Northwestern Polytechnical University

Though research of regional science and urban science has entered a new phase by taking complexity into account, it lacks a holistic and general methodology to guide its way ahead. Making Wuli-Shili-Renli systems methodology as stand and based on review of relative literature, this paper puts forward an integrated framework with methodological significance to meet needs of urban science research, namely Urban Systems Engineering (USE). USE regards urban whole as research object, with urban system, urban logic and urban institution as research dimensions, evolution, control and game as research techniques, which are the core of USE. In the framework of USE, three topics including urban self-organization, urban management and urban harmony are in turn probed by adopting methods of multi-agent simulation, system evaluation and early warning, and game and institutional analysis. The anticipative results will contribute to deeper understanding of evolution of urban space, optimization of urban management and betterment of urban institution, and will offer effective decision support to harmonious city building as well.

20-1 A Primary Study on Theory and Methods of Regional Talent Resource Plan Based on Coordinated Development: Taking Xian City of Western Chain as an Example

Sheng-long Zhao¹, Hui-feng Xue¹, Kuan-min Lu³, Xiao-dong Kou¹, (1) Northwestern Polytechnical University and (2) Xian University of Technology

It is pointed out that talent resource development has important influence on sustainable development of western china, but the phenomenon that talents are idle and wasted is very outstanding in each province and major city of the west. This has made negative influence on regional development. In order to realize the goal of talent-economy coordinated development, by using system theory and methods, analyzing the basic theory of coordinated development of talent and economy and reviewing the latest development of talent plan, the principles, methods and countermeasures of talent plan based on coordinated development are advanced. Finally, a positive research is presented by taking Xi'an of western china as an example; the results indicate that the theory and methods put forward in this paper are objective and feasible.

20-2 The Definition of Sustainable Development in the European Union's Forest Policy: Back to Basics

Sonia Hadj-Ayed, School of Law, University of Leeds

Sustainable development has become a popular buzzword in the 21st century, even in the European Union ('EU'). It has been enshrined as an objective in the Treaty of Amsterdam¹ and has further been developed in a Sustainable Development Strategy that lays down the general framework for Community action regarding sustainable development.² In addition, the Council adopted recently a Declaration on guiding principles of sustainable development.³ But what does sustainable development actually mean? The European Union has often referred to the concept by reiterating the Brundtland definition.⁴ This definition has however been criticized by many as too vague to ensure the adequate implementation of sustainable development. Nevertheless, there is a general consensus that any policy on sustainable development must aim at reconciling economic development, social equity and environmental protection. These interrelated components form the fundamental elements of sustainable development. Any precise definition should thus seek to integrate these three pillars. In this paper, I will focus on the EU's policy of forests. This policy consists primarily of three instruments, which will be referred to in the paper as the 'European Forest Framework'.⁵ In discussing the framework, the paper will highlight the lack of consistency between the three instruments to provide a reliable framework that ensures the sustainable use/management of forests. It will argue that with the application of a precise definition of sustainable development as exemplified in Regulation 2494/2000, many of the highlighted shortcomings in the EU's forest policy may be accentuated. The EU manages to provide a precise definition of sustainable development in Regulation 2494/2000/EC on the protection of tropical forests. This regulation integrates the economic, social and environmental dimension of forests in the EU's developing policy. The definition is welcomed as it provides an example of good practice within the EU in dealing with sustainable development. In addition, as this paper will argue, this definition may add to the overall coherence of the EU's policies on sustainable development.

20-3 China's Sustainable Growth: A Balanced Approach

Carmen Tsui, Kaizor Innovation

How would China realize its sustainable future differently from the rest of the world? According to the Eleventh Five-Year Plan (2006-2010), China has underlined sustainability and innovation as key guiding principles for national and social development. This paper looks into how a balanced approach can help China attain its development goals. The ability to re-think, to envision a sustainable future is the role of design innovation here. What are the possible ways that China can continuously fuel the growth of its consumer market while paying attention to environmental and social concerns? Goals towards sustainability are often multi-dimensional in nature, and at the same time, require integrative thinking and holistic approach to hold them together. Stakeholders' interests vary but eventually need to arrive at a shared understanding and a common voice to reach the defined goals. These processes often call for an ability to bridge gaps and balance priorities.

20-4 Implementing Sustainability Partnerships in Australian Regions: Challenges, Progress & Policy Implications

Tavis Potts, Australian Expert Group in Industry Studies, University of Western Sydney

The development of sustainability partnerships in Australian regions aims to integrate community, local government and business sectors in improving local and regional conditions. The global recognition of partnerships was announced at the World Summit on Sustainable Development in Johannesburg in 2002, resulting in increased attention from governments, academics and communities. Despite this international recognition, the implementation of partnerships within Australian localities has been slow to evolve. This paper examines the development of three regional sustainability partnerships from the broader Sydney metropolitan region and highlights their varying degrees of success, their obstacles and the key policy challenges.

All partnerships include a triple bottom line approach to regional sustainability issues, involving members of the business community, civil society, and local government. The paper concludes that partnerships are critical for the local and regional implementation of the broader Agenda 21 goals and the involvement of communities and business in mainstreaming sustainability principles. The paper explores the policy options available to local authorities to successfully implement sustainability partnerships within their communities and draws upon recent practice in the Australian context.

20-5 Chinese villages and their sustainable future

Heidi Dumreicher, Oikodrom

The situation in China is currently characterized by a disproportionate focus on the developments in towns and cities and until now a neglected situation in the rural areas, where yet still 70 % of the Chinese population are living. These facts show the need for interdisciplinary research co operation related to practice and exchange with the concerned people to manage the manifold imbalances between urban and rural areas sustainably. In this situation, the EU-China cooperation project SUCCESS carried out seven case studies in six Chinese provinces, asking the question "What to maintain? What to change?".

It generated future scenarios for these settlements, including the aspects of architecture and urbanistics.

The results gave important impact in the villages, but can also be seen as contribution to the dramatically changing urbanisation process in China, finding a balance between the traditional and the contemporary architectural approaches.

The approach shows new, interdisciplinary and transdisciplinary negotiation processes whereby the local knowledge and the expert knowledge find common results. The coordinator has developed a set of new tools and technologies for such processes, facilitating the face to face interchange between experts of very different disciplines. A concept of strong sustainability was the guiding principle for these future images.

It is based on the principle that only comprehensive concepts and living spaces and rural live should be recognized and esteemed in future as complement to urban lifestyles by the Chinese society. Innovative knowledge generation - like "systemic structure constellation" or a systems model approach - helped to bring out latent potential and needs of the dwellers.

The SUCCESS study was co-ordinated by Oikodrom The Vienna Institute for Urban Sustainability and conducted together with local team leaders who initiated a participatory process in each of the case study villages with the aim of involving village dwellers in a sustainability negotiation process.

Besides the participatory research methods, the innovative tool within this research project was the possibility for the dwellers to develop concrete ideas for sustainability oriented projects in their villages, and looking out for the financial support for implementing these ideas. By the end of the three years study of SUCCESS, each of the seven case study villages had carried out small project concepts and realised them. One village is building a public bathhouse that will work on a renewable energy basis, using an ecological water management and working on a special model of public private partnerships that allows for income generating, but also for counterbalancing the upcoming socio economic disparity. Another village has decided to go a pathway towards an ecological model village and has chosen biogas installation for every household as a small and doable project, one settlement develops a soft tourism concept and has changed the mobility access, one village has started women's writing classes, one village has decided to start a cooperation "big hand holds small hand" between the village and the university of the province capital.

The outcome of this participatory process is manifold. One major impact of these projects is the visibility of the results which is crucial for the village dwellers' awareness and confidence and their successful participation in decision making processes. Another impact is the replicability of the results.

21-1 Influence of Sodium Polyacrylate on Soil Water Retention and Growth of Horticultural Plants.

Sultana Afroz and Bruce Sutton, Faculty of Agriculture Food and Natural Resources, The University of Sydney, Australia

The effect of incorporating sodium polyacrylate (SPA) in soil and a soilless potting medium at rates of 0 to 1% (by weight) with different irrigation frequencies on the growth of pansy, pea, petunia and *Salvia* plants has been studied in glass house experiments. In separate experiments, the water retention capacity of SPA in soil, compost and at various electrical conductivity levels (0.2 to 1 dS/m,) of saline solution (NaCl and CaCl₂) was studied. The experimental results indicated that an SPA concentration of 1% could retain three times more water in soil and twice as much in soilless growth medium compared to the control treatment at field capacity. Water retention capacity of SPA decreases with increasing salt concentration in water but more water was retained in the presence of monovalent ions than divalent ions. Addition of SPA significantly increased plant height and dry matter of plants

and less frequent watering significantly decreased plant height, and dry matter in control treatment. Irrigation frequency has no significant effect on plant growth with 1% SPA. Irrigation intervals have significant effect on leaf water potential, leaf relative water content of plants and water content and water potential of the growth media. The addition of SPA derived from disposable nappies in municipal waste streams to soil or other plant growth media may both benefit the water management of the plants and provide an efficient recycling of a resource that otherwise tends to be disposed of in landfills.

21-2 Eco-design in practice - Case study Computer Mouse

Andreas Schiffeitner and Marek Stachura, KERP - Centre of Excellence for Electronic Scrap Recycling and Sustainable Product Design

"Eco-design" has been a widely discussed issue in the past years. The reasons are not only ongoing changes in the legal framework, which increasingly accounts for environmental aspects of production (e.g. the new EU Directives WEEE and RoHS, as well as the scheduled EuP Directive). It is also a growing environmental consciousness of the customer which forces producers to seriously reflect on this issue and not end up losing market share. Moreover, quite as many companies identify substantial streamlining potentials, as well as a high innovation potential which applied eco-design may generate. What we discover is a growing range of ecological expectations on the part of the various stakeholders: customers, the market, legislators, standards, eco-certificates, in-house efforts and interest, etc. How are these expectations to be met? What is applied ecodesign? How is a systematic and methodical eco-design process realized and how can a successful result be achieved? What are ways to substantially minimize the risk of failure? In-depth answers to these questions are provided by a real-life product project, the "Eco-mouse". The PC mouse is a widely available and well known product. Its structure and assembly are relatively simple – at the same time, its functional parts constitute a good representation of electronic consumer goods. This renders the PC mouse a well suited demonstrational object.

21-3 Eco-Tech Planning for Turkish Cities

Şule KARAASLAN, Özge YALÇINER ERCOŞKUN, Department of Urban and Regional Planning, Gazi University, Ankara-Turkey

The cities which have high urban growth, degradation of environmental quality, inadequate energy systems, decrease of agriculture and services, unemployment, poverty, increase in the world and called as unsustainable cities. For sustainable development, a good land use planning, a sustainable urban form, sustainable transport and energy planning are needed. The main aim of this study is to search a new sustainable settlement model as a solution for today's unsustainable cities. New settlement model is ecological-technological (ecotech) city model emerged as an alternative. Eco-tech settlement is the combination of ecology and technology, nature-friendly, and uses advanced geographic and environmental technologies services in the space. In this content, this study will look for cities of tomorrow based on topics like urban sustainability, eco-cities, smart cities, then will explain shortly the eco-tech cities, principles, world projects and put the parameters test for Turkey. Turkey is a developing country which is rapidly urbanizing against nature. The governments have many urban planning and transformation projects which are in practice ignoring urban ecology. This study presents a solution to this problem and claim that this eco-tech approach will change the planning system of Turkey. As a proposal, the applicability will be defined in different regions and site selection parameters will be listed, new model will be created which can be applicable in general in different regions of Turkey.

22-1 Policy Frameworks That Support Eco-Industrial Parks: The Hinton EIP and Other Case Studies

Tracy Casavant, Eco-Industrial Solutions Ltd

Eco-industrial parks represent the application of eco-industrial networking within an industrial park. EIPs support collaborative partnerships, or networks, between businesses, local governments, and wider communities resulting in more sustainable resource use. EIPs support niche-based strategic economic development; by-product synergies; ecological design; green infrastructure; shared business services.

One of the most important drivers and/or barriers to the successful design and operation of EIPs is the policy framework. Without appropriate policy tools in place it becomes very difficult to implement innovative strategies like EIPs. This paper presents a case study analysis of North American policy frameworks designed to support EIPs, such as community plans, economic development strategies, and land use bylaws. The paper also highlights our experiences in Hinton, Alberta, Canada.

As part of the Hinton EIP project, the Town developed a supportive policy and regulatory framework. The Town produced Canada's first eco-industrial zoning designation. The zone is supported by innovative development guidelines, which increase both flexibility and certainty offered to developers. Unlike zoning, the guidelines can be adopted by resolution. Therefore, they can be adapted to reflect changes in market conditions, advances in technology, etc., ensuring that the EIP remains an attractive, competitive, sustainable place to operate a business.

22-2 Creative Financing for Sustainable Development

Jonathan L. Watkins, University of Missouri-Kansas City

In this paper I will discuss various tax schemes that have been implemented in Kansas City Missouri. Through the research I will compare what projects are vital to a city's development and which projects should be viewed as detrimental to sustainable development.

A primary focus will be to look at the type of work (livable vs. non-livable wage) that is created by a city's development policies and how closely the city government works with private enterprise in their planning. My research is interested in capital/financial flows for cities/regions that do not have monetary sovereignty. I analyze trends in employment, city government budget, and investment in training (human capital) and infrastructure that tends to coexist with sustainable development.

Through this paper I want to study what implications there are on sustainable development projects, if any, stem from the city/regional government not having monetary sovereignty. In this respect it will be determine what level of public/private cooperation there should be for planning sustainable development.

22-3 Planning the Sustainable Eco-City in Taipei: Issues of Policy and Implementation

Szu-Li Sun, Department of Real Estate and Planning, The University of Reading Business School

In Taipei City, there has been a significant effort placed on policy-making and implementation aimed at developing a sustainable Eco-city. This paper aims to explore how the sustainable Eco-city policy was deployed and interpreted at a local city level, with particular emphasis on land use and transportation. It investigates the issues surrounding policy formulation, the structure of the planning process and the outcomes of over a decade of (variable) policy implementation. The evaluation is based on a broad conception of the sustainable Eco-city concept with four principles (environment, futurity, equality and participation) being used to investigate the evidence, although local interpretation of the principles is acknowledged and incorporated.

Many historical, political, cultural, economic and geographical factors have affected the evolution of Eco-city policy in Taipei City. Most of the plans and policies were technology-oriented and attempted to improve international competitive infrastructure. Issues of citizenship and internationalism has been highlighted more recently, although strong cultural and political traditions have compromised these 'green shoots' to some extent.

The planning process has not been very open to citizen participation and this has been constrained by the main governmental institutions, which have tended to have a contradictory attitude towards extending the involvement of NGO and citizen groups. Government politicians and officials have made some steps towards encouraging citizen participation and increasing self-management. For instance, they have initiated a community network to support local area improvement and launched several programs such as the Community Planner System. However, they have been very cautious in transferring any real power and decision-making to citizens in a participatory way and have retained central control of the (slightly) more decentralized planning process that has been initiated.

The environmental and social outcomes of Taipei Eco-city 'policy' have been rather limited, although it is still difficult to evaluate this because no coherent set of sustainability indicators have so far been utilised. A continued emphasis on capitalist economic development, globalisation and bureaucratic control has impeded a full engagement with the Eco-city project. The dependence on elite groupings in central and local government provides a challenge that has yet to be adequately dealt with.

23-1 Action Model for Sustainable Development at Long Valley

Lister Lai Ping Cheung¹, Katie H. L. Chick¹, Scott H. Linder¹ and B.C. H. Hau², (1) The Conservancy Association; Department of Ecology & Biodiversity, The University of Hong Kong

Long Valley is an important agricultural freshwater wetland habitat that supports diverse bird fauna in Hong Kong. Apart from the rare and endangered species, more than half of the 434 species of birds in Hong Kong have been recorded at Long Valley. The area is also rich in historical and cultural assets as the oldest indigenous clans settled there more than a thousand years ago. The unique ecological, historical and cultural elements contribute to its high conservation value. However, due to complicated land ownerships in Long Valley, no effective conservation measures have been implemented. In view of this, the Conservancy Association has launched a two-year project attempting to develop a sustainable development model integrating social, environmental and economic aspects at Long Valley in March 2005. The indigenous communities in Hong Kong have long been very negative towards environmental NGOs as the latter are often seen as infringing on their property rights in land conservation issues in the past. This project is a breakthrough in local history as it represents the first environmental project between an environmental NGO and the indigenous communities in Hong Kong. This paper outlines the intriguing process of drawing in local communities to participate in this sustainable development project. The keys to this early success include the building of trust through genuine communication, the important role played by the middlemen and persistence. For most sustainable development projects, stakeholders' participation is critically important. The various ways to involve the local communities in this project are also introduced in this paper.

23-2 Tourism as Development Mechanism: a case of Bhutan

Chhewang Rinzin¹, Walter J.V. Vermeulen² and Pieter Glasbergen², (1) Royal Institute of Management, Bhutan; (2) Utrecht University

Over the last few decades Bhutan has followed a controlled tourism policy, with a 'high value, low volume' strategy as the guiding principle. This approach is based on the country's sustainable development policy. In recent years,

tourism has been identified as the backbone of the private sector growth that will bring about societal transition in the rural communities. To this end, a 'high value, low impact' strategy was adopted, which would allow for a doubling of the number of tourists in the next decade. Growing numbers of visitors could jeopardise the intended low impact on both nature and culture, which are the selling points of Bhutanese tourism. Therefore in this article we examine the contribution of tourism to the sustainable development of Bhutan, focussing on the socio-economic, environmental and cultural impacts of present-day tourism. Information was gathered by conducting field surveys among tour operators and hotels and restaurants and in rural communities that are directly associated with the tourism sector, and by analysing financial data relating to tourism. The results indicate that tourism has the potential to stimulate private sector growth by producing spin-off effects in the related service sector and to transform the rural economy. The impact on culture and the environment is currently perceived to be low. However, the expected growth may, if it is not managed properly, erode the unique nature of tourism in Bhutan.

24-1 Good Environmental Governance Through EIA: The Case of Public Sector Development Projects In Pakistan

Obaidullah Nadeem and Rizwan Hameed, Department of City & Regional Planning, University of Engineering & Technology, Lahore, Pakistan

The potential of EIA as tool to achieving sustainability can best be realized when it is applied invariably not only to private but also to public sector projects. The later can also represent a key attribute of good environmental governance on the part of the state to promote and implement the agenda of sustainable development. In practice, the execution of public sector projects without EIA and if conducted, the quality of EIA report and the way the recommendations of EIA are considered in decision making have often been under debate particularly in the context of developing countries. This paper discusses the extent and quality of application of EIA to public sector projects in Pakistan. The analysis is based on interviews with concerned government officials, and review of selected projects. The paper argues that despite some inadequacies, EIA exercise done for a project of National Highways Authority can be followed as a best practice model by others to develop a highly responsible image of government agencies. While the realization of the need to fulfil EIA requirements is growing amongst government agencies, a sustained commitment on the part of the government towards environmental regulation is needed to enhance effectiveness of EIA.

24-2 Mobilizing Stakeholders in Achieving Good Local Environmental Governance through a Coordinated Decision-making Network

Lu Xing, Jun Bi, Lei Shi, Haiyan Zhang and Lingxuan Liu, School of Environment, Nanjing University, P.R.China

It has been a national policy to promote good environmental governance in China. However, it has never been an easy job at the local level. Believing that local environmental governance is one of the real powers that play important role in local environmental protection, the authors conducted two surveys in 2003 and 2004, respectively, to help the researchers, decision-makers, enterprise managers and the public grasp the real pictures at the local level.

The surveys were completed for 121 enterprises at China –Singapore Suzhou Industrial Park and 334 enterprises in Wujin District of Changzhou City. Institutional economy theory was adopted to analyze the relationships among various stakeholders. Ideally, good environmental governance requires a well coordinated network that does not exclude any significant stakeholders in the decision-making process. However, in the reality, economic development has been the core driving forces to affect the whole decision-making process. The paper is trying to build a multi-agent model to explain the causes and effects of current governance model in South Jiangsu. The results will shape deeply on the policy-making process in this region.

24-3 Models for Eco-Management in Industrial Parks

Tiina Salonen, University of Leipzig

In Asia industrial parks frequently establish a basis for national economic development plans whereas in Europe they normally evolve through structural changes of industry. In China for instance the industrial parks have functioned as main bases to attract foreign investment and to encourage local industrialization since the late 1970s and their unofficial number exceeded 6.000 by the end of 2004. The fast economic growth has led to serious environmental impacts and regional resource scarcity issues in many industrialized areas. In order to support the more sustainable development industrial parks are frequently chosen as demonstration objects for implementation of eco-plans with the aim of comprehensive integrated resources management.

In order to operate industrial parks eco-efficiently, new management structures are required for which public or private models can be applied. All the German industrial parks use private models with a park managing company but in many Asian countries, on the contrary, industrial parks are often managed by public authorities. The different management models are characterized by specific strategies leading to various roles of the park management and the implementation of different kinds of management instruments. This paper presents the management structures and instruments adopted in industrial parks applying public models using the results of two Chinese case studies. The paper concludes with a comparison of institutional and functional management characteristics of public and private models in relation to eco-performance based on the case studies from China and Germany.

25-1 Land use disputes in Ghana's mining communities: developing sustainable strategies

Louise Jayne Obara and Heledd Jenkins, ESRC Centre for Business Relationships, Accountability, Sustainability and Society (BRASS)

In response to heightened global awareness of sustainability, environmental and ethical issues, CSR has become a priority concern in the mining industry. One of the more serious CSR policy challenges faced by governments and companies in mineral-rich developing countries is the equitable resolution of disputes between small-scale and large-scale miners; one country where this issue has become noticeably intense is Ghana. Several small-scale mining communities – mainly individuals carrying out illegal activities – have surfaced, operating alongside the country's large-scale miners.

The illegal miners are accused of causing widespread environmental damage, promoting child labour, and encroaching and causing grievances on land plots demarcated to large-scale miners. This paper describes research undertaken in Ghana's Western Region to understand the nature of the conflict between small-scale miners and large-scale mining companies. Interviews with a range of key stakeholders were conducted to access a range of informative perspectives on the issue. The paper presents case studies from two mining companies and critically assesses and compares the different approaches taken by each company towards small-scale mining communities. The paper concludes with a discussion of the strategies proposed by the government and the mining companies to alleviate the disputes, and suggests alternative sustainable strategies.

25-2 Is the environmental Kuznets Curve Valid in the Case of Food Consumption

Markus Valtter Vinnari, Turku School of Economics and Business Administration, Finland Futures Research Centre

Food consumption and its environmental impacts have been discussed widely. There are analyses which show that a vegetarian diet causes a smaller environmental burden than an animal based diet. A hypothesis known as the Environmental Kuznets Curve (EKC) is a systematic relationship between income changes and environmental quality. The hypothesis is that the environmental burden decreases when income levels rise. This study analyses the EKC in the case of food consumption. The paper analyses the animal based calories and the animal based protein consumed, the total meat consumption and the bovine meat consumption in EU-15 countries between the years 1961 and 2001 per GDP per person. The main research question in this study is whether consumers decrease their animal based food consumption and their meat consumption at higher income levels. Usually the relationship between a consumption decision and its environmental effects is very difficult for the consumer to observe. In the case of food consumption, ethical issues such as animal welfare can support the changes. This analysis reveals that in the case of animal based calories and protein consumption, food consumption has decreased in relative terms but not in absolute values. In the case of bovine meat consumption, the environmental Kuznets curve hypothesis seems to hold. Meat consumption seems to apex at the income level of 15 000 USD per person in EU-15 countries.

25-3 Forest Management in Zagros Area: a situation analysis

Davood Samari and Somayeh Davari, Islamic Azad University

In Iran, the responsibility for conservation and restoration of forests, as national resources, rests with the Government. In any analysis of forest management, the priority should be, thus, delivered to the role of the Government. As far as management of forests in Zagros Area is concerned, both the fragile ecosystem and growing destruction process have made it inevitable to follow a rationalized and scientific-based methodology for programs to be managed or carried out. Practicing this sort of management, however, calls for comprehensive studies so as to give deep insights into the recognition of the existing resources, constraints and needs. To this end, socio-economic concerns need to be emphasized. Also, appropriate planning for generating employment opportunities, changing farming and animal-husbandry systems, as well as establishing by-industries can protect the forests from being further destroyed. This article is an attempt to provide some recommendations for improving the present state (status quo) through an analytical study of the factors involved in the management of forests.

27-1 Urban growth versus sustainability in Algeria. Case study of Algiers, the capital city

Farid Khalil, Polytechnic School of Architecture and Urbanism, Algiers, Algeria

Cities are becoming the engines of national economic growth and the magnets for new residents flooding in from rural areas. As a result, the sustainability of cities is under pressure. Decision-makers at all levels are faced with task of how to resolve urban problems from transportation to waste management, from drinking water supply to the preservation of urban green space. As population grows the urbanisation of society is inevitable. Urbanisation leads to an increased impact on the environment. Algeria is a very illustrative case. Among the factors contributing to the environmental degradation in Algeria was population growth. The country, after its independence, has made several efforts for the urban development of the country. Unfortunately, this was made at the expenses of many fertile lands. However, and since recently, a great awareness among the politicians and experts had emerged. This awareness emphasises on the need to put aside the old policies and proposes a newly ones which are more likely to be adapted to tackle the situation. In this regard, the ministry of town and that of environment are working together to achieve a better sustainability in the future growth of Algeria. This study aims, essentially, to analyse the impact of the former policies which generated a very huge loss among very fertile territories and stress out the need to boost the newly policies and verify to what extent they were implemented and what results could be expected to control the urban growth and give hence place to a sustainable development of Algiers, the capital city.

27-2 It Takes a Village: A Scientific Design Process for Generating Sustainable Cities in China

Richard S. Levine, Michael T. Hughes and Casey Ryan Mather, Center for Sustainable Cities, University of Kentucky

The recently completed European Commission sponsored SUCCESS project studied rural villages in six Chinese provinces from a sustainability perspective. With as yet few inroads from the larger unsustainable Chinese economy, the villages are excellent living exemplars of an almost complete proto-sustainable economy, albeit at no longer acceptable levels of development and opportunity. The form of the villages, their households, and their agricultural allotments create a visual record of their material economy. Systems dynamics models of these village economies were created to experiment with many .what if. scenarios for future development. At first, inherently unsustainable aspects of village life (fossil fuels, agricultural chemicals, etc.) were replaced in the models with comparable sustainability oriented means. Through a civil society, sustainable scenario building process the farmers were able to understand both the consequences of their current activities as well as a range of their future prospects. The researchers were then able to extend this multiple scenario building process to sequentially enlarge these sustainable village models to the scale of towns and eventually cities. Through this Scientific Design Process, it thus becomes possible to project new, modern, sustainable city models rooted in Chinese circumstance and tradition.

27-3 Sustainability and citizenship values in low-income dwelling improvements in Maracaibo, Venezuela

Hugo Rodolfo Rincon, Elizabeth Tsoi, Marina González and José Padilla, School of Architecture and Design, University of Zulia, Venezuela

In Maracaibo (pop. 1,8 mill.), Venezuela, more than 65 percent of the population lives in poor self-built settlements, lacking infrastructure, services, and adequate housing. In order to confront this reality, a participatory approach to sustainable development has being implemented since 1997, in which the Municipality, the local University and two NGOs provide financial, technical and social opportunities to dwellers who are excluded from the regular financial system. The housing component of the "Promotion of Full Citizenship Program" sets and implements actions in poor communities tending to physically and socially benefit households, neighborhoods and the urban habitat, granting credits for dwelling improvements, training in citizenship values, and promoting sustainable construction strategies. The paper presents the impact that the technical assistance, provided by the program, has had in a sample group of two hundred dwellings in two poor neighborhoods. The study includes first, the construction improvement process (use of appropriate and affordable materials and local expertise); second, the spatial functionality (adequate spatial organization and progressive housing), and third, the participatory strategy in the design and follow-up of individual projects. The program has motivated people's concern in environmental and community issues; nevertheless people's participation beyond the household level is not yet strengthened.

27-4 Urban land markets and Impact of Policy Intervention: A Case of Study of Phnom Penh, Cambodia

Tep Makathy and Tetsuo Kidokoro, International Development and Regional Planning Unit, Department of Urban Engineering, The University of Tokyo

In most developing countries, the factors and forces of market-economy are gradually becoming active in guiding the land markets, in which land has been transformed to a commodity, which can be freely bought and sold. Though, land markets do not provide equal chances to different level of income earners in the society to gain access to land for housing. Developers, with access to large capital investment and administrative information, manage to hold large tracts of land off the market and wait for the price to increase and sale in the market. Affordability for land becomes more and more restricted to the poor while demand in land for shelters increases. The poor find themselves in the losing position, and gradually excluded from the process. Various efforts have been made by the public sector to improve access to land for housing the urban poor. Yet, development intervention has not been effective in lifting people out of the poverty.

From the review of available literatures, this article discusses the situation of land markets in Phnom Penh and the impacts of the development intervention on the urban poor. The article draws on a case study of the resettlement

site in Anlong Kngan of Resey Keov district, a relocation project implemented by Municipality of Phnom Penh, to support the claim. Last section presents the policy recommendation.

27-5 Public Participation - A Good Practice towards Sustainable City Development

Bernard Wan Fung Lim and Andy Wan Ho Wong, Department of Architecture, The Chinese University of Hong Kong

With the emerging awareness towards the importance of public participation in Hong Kong, this paper demonstrates principles and recent examples on how to implement participatory projects related to community architecture and planning at different scales, ranging from the design and planning of a building, a community facility, a neighbourhood, a district to territory. Forms of participatory activities and level of participation adopted are varied by cases and highly depended on the nature of the issues, availability of resources pool and the connection with relevant stakeholders. Significant examples and cases in Hong Kong context have been provided in this paper as references for good practices such that the practitioners can easily apply the general procedures, skills and techniques on their participatory projects.

Public participation is not only the process to allow the community to participate, express their aspirations and impose their influences in the decision-making process, but more importantly, it allows all the stakeholders to contribute in the process to achieve a better solution for the development process to be more acceptable by the society. Through empowering the general public, and harmonizing the planning and design process, this paper provides a wider perspective that public participation is essential and possible regardless of the scale and scope of the projects.

28-1 Sustainability Through "Cradle-To-Cradle" Concept

Salah Mahmoud El-Haggar, The American University in Cairo

Ever since the Earth Summit of Rio de Janeiro in 1992, much has been written and continues to be written about "Sustainability". Meanwhile, we have lost the direction to measure sustainability because we need to think first how can we develop sustainability and then develop indicator(s) to measure sustainability (or the percentage of sustainability). Our real environmental and economical problem in this century is that development of science and technology have increased human capacity to extract resources from nature, then process it, use it, but finally it is not returned back to the environment to regenerate it "cradle-to-grave concept". Renewable natural resources concept is a must for sustainability, i.e. the word "disposal" should be removed from our daily dictionary. Unsustainable human activities are creating an open loop "cradle-to-grave" that cannot continue and has to reach one day to a dead end. Closing the loop for renewable resources is the role of changing "cradle-to-grave concept" to "cradle-to-cradle concept".

The tool for sustainable human economic systems is life cycle assessment according to "cradle-to-cradle" concept not "cradle-to-grave" concept. A new hierarchy for waste management to approach "cradle-to-cradle" concept was developed at The American University in Cairo in 2001 and upgraded in 2003 called "7-Rs cradle-to-cradle approach". This approach is based on the concept of adapting the best practicable environmental option (from not only technical aspects but also from economical and social aspects) for individual waste streams and dealing with waste as a by-product. This 7-Rs cradle-to-cradle Rule (Regulation, Reduce, Reuse, Recycle, Recovery, Rethinking and Renovation) is the basis for sustainability. This rule will band the disposal and treatment facilities and develop renewable material resources.

The sustainability formula might change from one country to another according to the level of environmental awareness and culture. The formula should have the same trend as the power factor formula used in electricity to calculate the penalty/bonus according to standard power factor in the country and the energy cost.

28-2 Sustainable Development and Network Information

Khurram Shahid Delgado, Khurram Shahid Malik and Amir Niamat, Hope Worldwide-Pakistan

Hope Worldwide-Pakistan is an International, Inter denominational, Non-Governmental, Non-profitable organization working for the Environment, Youth and Enhancement of education, Health care, Women Empowerment for the poor and needy deserving community in Pakistan.

The awareness of Education, civic sense, social organization, community development, environmental protection and sustainable development with social uplift of the common people among all the strata of activity is our prime goal of Hope Worldwide-Pakistan. A community formulates solutions to the local problems by itself, through rethinking and redirecting the best practices and ideas prevailing in the social set-up. This process incorporates the capacity of local leaders and organizations.

Hope Worldwide-Pakistan wants to create a forum for policy makers to learn about the innovations and consider opportunities for up scaling them or incorporating them into policy by bringing together multi-sectoral groups around common problems or points so that they may collectively generate, implement or replicate innovations directed by the society. In this way the adapter (he/she) can feel motivation similar to that experienced by the original innovator. In terms of concrete actions and projects, three approaches will be followed: publicize, interact, and support.

28-3 Economic Growth and Environmental Sustainability in Malaysia: An Empirical Analysis and Policy Options

Chamhuri Siwar, Md. Elias Hossain, Nik Hashim Nik Mustapha and Abdul Hamid Jaafar, Universiti Kebangsaan Malaysia

The search for environmental sustainability at the face of rapid economic growth has surfaced as a topic worldwide. Economic growth has generally been considered as a way to reduce poverty in the developing countries. However, economic growth supported by unsustainable production and consumption activities creates direct environmental costs and undermine the natural resource base necessary to sustain long-term growth prospects. The objective of this paper is to analyze empirically the relationship between economic growth and the environment, and the implication of that relationship on environmental sustainability in Malaysia. The empirical relationship between growth and environmental degradation is estimated using econometric techniques, fitted with time-series data on relevant socio-economic variables and data on selected air quality parameters from six monitoring stations situated at *Klang Valley* region, Malaysia. Although the so-called inverted-U relationship between economic growth and environmental degradation implies the possibility of environmental improvement after certain threshold point, the relationships are not clear-cut, and the process is not automatic unless appropriate policy initiatives are taken. Policy options for achieving environmental sustainability and better environmental performance are suggested.

28-4 Sustainable Development, Eco-Industrial Networking, & Your Community Infrastructure: What Makes Infrastructure Sustainable?

Jim Ireland, Eco-Industrial Solutions

Eco-Industrial Networking (EIN) creates collaborative networks between businesses, governments, and communities to more efficiently and effectively use resources, such as materials and energy, but also including land, infrastructure, and people. Municipalities are beginning to realize the multiple benefits of applying EIN to public infrastructure systems.

EIN supports green and integrated infrastructure, which includes systems that are distributed, service-oriented, interconnected, ecological, low impact or renewable, context appropriate, and adaptable. Systems are also multi-objective, achieving goals and targets set in a variety of areas. Moreover, by using the EIN approach, infrastructure systems can be viewed as 'anchor tenants', linkages from which emerge and support the entire community. Applying a systems perspective to infrastructure design and operation allows one to embrace a variety of important opportunities not the least of which is community economic development.

This paper uses a case study analysis to present two major examples of applying EIN to community infrastructure systems: 1) A cold climate ecological wastewater treatment system and its important economic development opportunities for a small Alberta community; 2) Hinton Eco-Industrial Park (EIP), where the infrastructure is designed to include distributed, green technologies; integrate with the site; and facilitate the flow of water, materials, and energy amongst companies.

29-1 The development and market success of environmental innovations

Fawzi Halila, Centre for Product Development Research (CPDR), School of Business & Engineering, Halmstad University

There is currently a major need for efforts in the environmental area. The global environmental market is estimated to 4,000 billion Sw. cr. (Swedish crown) and the rate of growth is 5 – 10 percent per year. Environmental innovations that replace the solutions currently in place will play a major role in decreasing the negative impact on the environment and will therefore contribute to a sustainable development. However, there are still indications that environmental innovations have difficulty gaining market shares and reaching the presumed customer base, possibly even more difficult than other innovations, but research about the diffusion of different types of innovations is limited.

This study is an attempt to improve the understanding for the development and market success of environmental innovations. The purpose is to describe and explain the difference between market success of environmental innovations and "other" innovations. The case study was employed as the research strategy. Six out of twelve innovations observed, in an effort to answer the research question, were environmental innovations, while the other six were classified as "other" innovations. The data for this study was obtained mainly through interviews with the innovators. The study shows that there are similarities and differences between the successful environmental- and "other" innovations. One similarity is that both types of successful innovations are based on results gathered from extensive research. Another similarity is that the successful innovators have an important network with different competences. A difference is that the analysis shows that the network is important to the environmental innovators, especially during the early phase of the process, where the focus is to solve technological problems. For the other innovators, the network matters the most during the end of the innovation process, when the focus is on marketing.

29-2 Investment in cleaner technologies by the Finnish industry

Eila Salomaa, Helsinki University of Technology

Environmental protection investments by industrial companies consist of investments in measures for both pollution treatment and pollution prevention. Pollution prevention, i.e. reducing the pollution at the source, can be

made by using process-integrated or cleaner technologies. In this article, investments in cleaner technologies are presented and compared with the total environmental protection investments made by the industry in Finland. The time period covered is from 1992 to 2003. In the Finnish industry, investment in process-integrated technologies has typically been an essential component of environmental protection investments. The proportion has varied greatly during the studied period, but without a visible trend.

29-3 ProdTect - a flexible solution to design the End of Life Performance of products

Ioan Revnic and Gottfried Wanderer, KERP Engineering

Today's decision making regarding the product design process comprises more than just the economic aspect [7]. Environmental requirements have taken more importance in this design process. In addition to increasing the customer satisfaction and the competition ability of a product producer, the fulfillment of these requirements is becoming an inevitable cornerstone to be able to comply with the existing regulations. New EU legislation, such as the WEEE and the RoHS directive, forces producers to take action for increasing the recyclability of their products and to take responsibility regarding related recycling or end-of-life costs. To meet these requirements, product developers have to take these aspects into consideration and provide product documentation as well as transferring data to supplying partners and customers which means a volume of additional efforts difficult to handle. ProdTect, the tool for Product Architects, enables producers to keep comprehensive control on a high bandwidth of parameters in predictive design. ProdTect protects producers from unexpected liabilities and helps turning existing challenges into new opportunities.

30-1 An Empirical Study on Solid Waste Management Amidst Urban Poverty

Chamhuri Siwar, Wahid Murad and Elias Hossain, Institute for Environment and Development (LESTARI), Universiti Kebangsaan Malaysia

This study assesses knowledge, attitude, and behavior concerning solid waste management amongst the urban poor residing in squatters and low-cost flats of Kuala Lumpur city, Malaysia. To attain the objective, the study employed some statistical techniques such as t-tests of equality of means, one-way ANOVA, *chi-square* "likelihood ratio" tests and simple descriptive statistics. In particular, the statistical techniques were used to determine and assess the factors that are significantly influencing environmental knowledge, attitude, and behavior of the urban poor concerning solid waste management. The findings of the study show that the poor communities have been proven to behave in ways matching with and conducive to environmentally sound solid waste management, for instance, by practicing recycling, reusing and waste source reduction. This study also proves that the urban low-income communities generally have a very positive role from a sound environmental management perspective, as they are the main recyclers, re-users, and source-reducers of solid waste. The study, however, suggests that policies should be formulated to focus on promoting knowledge, education and skills of the urban poor together with empowering them as a means of promoting their living conditions.

30-2 Industrial Recycle Network, the Pivotal Point for Sustainable

Xiaoqin Liu, Huasheng Xie and Jingling Bao, Tianjin Academy of Environmental Science

With economic development and social progress, resources and environmental problems have become a worldwide concern. Sustainable development _ "meeting the needs of the present without compromising the ability of future generations to meet their own needs" _ had been put forward for many years. People have been conducting broad researches for this from the environmental point of view, or from the economic or social point of view, which has significantly promoted sustainable development practice. With more and more calls on the harmonious development for economy and ecological environment, circular economy, as an era requirement, has appeared. In this paper, we expatiate on the nature of circular economy, a kind of sustainable economy. We also illustrate and analyze some related research on promoting sustainable development, such as cleaner production, life cycle assessment (LCA), Green gross domestic products (GDP), circular economy and industry ecology. Then, we discuss the possibility and feasibility of sustainable development practice. Finally, we conclude that industrial recycle network is the pivotal point for circular economy and sustainable development practice. Some case studies are showed in this paper.

30-3 Social Capital and Community-Based Solid Waste Management: A Case Study of Three Urban Communities in Songkhla, Thailand

Jawanit Kittitornkool, Faculty of Environmental Management, Prince of Songkla University, Thailand

This paper is the outcome of a research project on the community participation in solid waste management in the Community-Based Recycling in Thailand (CBRINT) Project in Hat Yai District, Songkhla Province in Southern Thailand between 2003 and 2005. The research methods included semi-structured interviews and participant observations of activities and projects in three urban communities. The twenty-two interviewees included municipal officials, community committee members (CC), active villagers and the CBRINT staff. Factors limiting the project participation include municipal constraints, as well as social capital and few communication channels in the communities. Major structural drawbacks are associated with social capital and the limitations of municipalities in the Thai context. Social capital in the communities is based on their historical development, social, economic and physical features, the strength of CCs, and the relationship between the CCs and the municipalities. The degrees of social interaction in the communities depend on public space and activities, as well as interaction opportunities of the members. Three types of social network are identified: kinship networks, friendship networks, and patron-

cliental systems in local politics. Structural problems and external factors constrain the municipalities, as well as, recommendations of how to promote a community-based solid waste management project, are given.

31-1 Novel Excessive Product Packaging Restrictions

Chih-Ku Chen, Jia-Pei Chen, Chih-Hao Shen and Hsin-Ying Chuang, Sustainable Environment Engineering Consultants Co. Ltd.,

A novel Excessive Product Packaging Restrictions will be enforced, by Taiwan Environment Protection Administration (TEPA), to reduce packaging waste and encourage green packaging design. Packaging gift box for pastries, cosmetic, alcoholic beverage, processed food and computer software optical disks is requested to avoid excessive packaging on the basis of packaging volume ratio (PVR), packaging layer and single material. Korea's experience is referred to avoid possible Non-Technical Barrier (NTB) on trade and its standard is harmonized in accordance with simplified metering method which provides a viable mechanism for on-site auditing. Based on the new packaging restriction regulation, the packaging volume ratio for the regulated products shall be less than 1, and the number of packaging layers shall be no more than 3 for pastries and disks of computer program works and no more than 2 for all other regulated products. The first stage of the regulation will come into effect starting July 1, 2006, covering pastries, cosmetics, alcoholic products and disks of computer program works. An electronic EPPRs Inspection Integrated Application (IIA) is developed as the platform for further audit reporting that is aimed to reduce unnecessary audit loading. It's estimated that the regulation will reduce the amounts of packaging by 26% each year.

31-3 Sino-Australian Comparative Study of Environmental Policy and Sustainable Development

Wang Hua¹ and Stuart Menzies², (1) Jiangsu Provincial Academy of Environmental Sciences; (2) Australian Volunteers International

Through analyzing the current level of sustainable development in Jiangsu and the Australian State of Victoria, a comparison of the adequacy of existing laws and policies of environmental and sustainable development is made. Following this comparative assessment, a sustainability management framework and appropriate policy options for sustainable development in Jiangsu Province is presented. The sustainability framework and several suggested policy options draw primarily upon the experience of sustainability management in Victoria.

31-4 Cleaner Production: An Effective Strategy for Sustainable Development in China

Lei Shi, Jun Bi and Lu Xing, School of Environment, Nanjing University, P. R. China

Cleaner Production (CP) was adopted as an environmental preventive strategy in China since the early 1990s. It has significant impacts on the design and production activities of heavy polluters and is beneficial for sustainable development in China. This paper provides a comprehensive review of CP practices in China. Progress in legislation, policy, demonstration projects, training and practices at both national and local levels are surveyed and analyzed. A particular emphasis is given to the development and implementation of "China's Cleaner Production Promotion Law".

The second part of the paper portrays the potentials of CP from a local perspective by providing a case study in Qingdao of Shandong Province. Local policies and regulations related to CP are analyzed. Information of 21 enterprises is collected and an indicator system is developed to evaluate the effectiveness of CP implementation. Initial results show that CP not only alleviates environmental pollution and improves the environmental performance, but also brings significant economic benefit. It is realized that CP could be adopted as an important strategy to promote sustainable development at enterprise level. Experiences and lessons from the implementation of CP are summarized, and constructive suggestions are given to improve the effectiveness of CP in China.

32-1 Environmental NGOs and the value systems behind their core activities

Yvonne Myrtha Scherrer, Institute for Sustainable Management, University OAS North Western Switzerland

The ongoing globalisation process and the political and structural changes of the last 20 years led to a rise in civil society organisations' importance and influence regarding social, environmental and economic issues. In the same period, the concept of sustainable development was introduced and later on strongly promoted and integrated in many international agreements, especially in the wake of the Earth Summit in Rio in 1992. Given the global impact of the sustainability concept, the first question in the frame of this "research in progress" is whether and to what extent there are any civil society organisations acting as players for sustainability. On this background, the paper investigates to what extent the concept of sustainable development has been adopted by three worldwide leading civil society organisations, in the past predominately involved in environmental conservation and protection: Greenpeace International, IUCN International and WWF International. In order to tackle this question, references are made to the theoretical background of organisational sociology. It has been assumed that the values of individuals and groups significantly affect an organisation's mission and strategy. It is therefore interesting to investigate whether or to what extent the value shift from the concept of environmental protection towards sustainable development did take place in the three organisations. The research reveals that the three organisations integrated the sustainability concept to different degrees. The differences resulted from the respective dominant value set of the organisation: The more an organisation is bound to the idea of (pure)

environmental protection, the less it is inclined to adopt strategies whose implicit value systems contradict a strong bio- or eco-centric position.

32-2 Measuring Social Capacity for Environmental Management in Transport Sector in Beijing Based on an Attitudinal Survey from the Perspective of Civil Society

Junyi Zhang and Akimasa Fujiwara, Graduate School for International Development and Cooperation, Hiroshima University

Most of existing studies have widely applied macro-level data to measure the capacities of actors involved in environmental management. However, such macro-level data cannot be used to properly capture the quality of environmental management. Under such circumstances, we suggest integrating the following three aspects in the same framework.

1) Applying the concept of service quality to incorporate the influence of quality of environmental management in the measurement of capacity.

2) Adopting the DPSIR (Driving forces, Pressure, State, Impact and Response) framework to reflect the cause-effect relationships between the essential elements in environmental management. 3) Applying structural equation model to measure the capacity of each actor and its influences on environmental systems. Using the data collected from the citizens in Beijing, we empirically confirmed the effectiveness of the proposed analysis framework in measuring the capacity of civil society for urban air quality management in transport sector. We also found that there exist strong correlations among three actors' capacities, and capacity of civil society has the largest influence on the impact of people's health, livability and ecosystems. The citizens also perceive that enhancing capacity of civil society is the only way to improve current situations of transport system, air pollution and ecosystems.

32-3 Cooperative business-NGO partnerships in Hong Kong: NGO perspective

Sukhmani Kaur Mantel, Dennis Cheung, Richard Welford and Peter Hills, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

Over the past ten years, processes of environmental reform have been increasingly shaped by the concept of cooperative environmental management: voluntary agreements between businesses and government, and between businesses and NGOs. Indeed, the partnership theme was a major outcome of the World Summit on Sustainable Development in Johannesburg in 2002. Voluntarism and partnership are exerting an increasingly powerful influence over environmental policy in Europe, the USA and elsewhere but have yet to figure prominently in Hong Kong. This paper provides results of extensive interviews to assess cooperative environmental relationships between businesses and NGOs in Hong Kong, and the barriers and positive drivers for these partnerships. Interviews with ten partnering NGOs found most quite optimistic about voluntary cooperative relationships in what has been or can be achieved without compromising the NGO. Non-partnering NGOs interviewed were also hopeful about future partnerships although hesitant about constraint on their independence. Overall, NGOs expressed the need for capacity building on governance issues, on negotiating partnerships with businesses, and hope that business associations and government can provide support for future partnerships. Issues of weak economy, business dominated thinking, weak civil society, and lack of top level commitment to environment also need to be addressed.

33-1 From Housing to Urban Vitality: a socio-cultural assessment

Qu Lei, Delft University of Technology, the Netherlands

From the point of view of bottom-up, Housing, correlated to the basic questions of who (residents), where (locations), what (typologies), and more comprehensive questions of why (policy, market, price, working opportunities, land use, transportation, physical environment, social networks, culture), determines not only the residential morphology of parts of the city, but how the city grows and runs. These individual choices on housing manifest patent diversities upon socio-cultural groups, which were stratified dramatically in the era of globalization, when the urban rich and poor get segregated. As a common phenomenon, the concentration and homogeneous status of marginal or middle-low income population in certain urban areas is being intensified, e.g. historical inner city area, underdeveloped periphery, or locations with downgraded environmental conditions, followed with urban decay and violence. To find out a top-down approach to intervene such problematic process is meaningful for urban governance, seeking for sustainable urban development models. This paper will make a case study of Beijing Historical Inner City Area. With the principles of "Social Justice" and "Balanced urban development", this paper will try to assess "vitality" of historic housing areas, with criteria of social network, living environment, and connectivity with other urban centralities, etc.

33-2 Spatial Configuration and its Effect on Community Space: A Study of Compact Built Environment in Hong Kong

Afroza Parvin, Arelen Min Ye and Beisi Jia, Department of Architecture, The University of Hong Kong

The combination of rapid population growth and limited land resources made dispersed development unsustainable in Hong Kong. The Hong Kong model of urban development is characterized by extreme high-density with multilevel spaces arranged in grade separated circulation system. Initially the multilevel circulation had been created mainly to separate pedestrians from vehicles but over time it has evolved as an integral part of the built

environment and social life that contributes to the unique patterns of space use. Using a computer-based technique known as "space syntax" this study investigates the spatial configuration of a high density mixed use residential development to understand how it works and impacts upon the patterns of community space use and thereby upon potential social interaction. Preliminary results from the case study suggest that, notwithstanding the multiple interacting effects of urban design parameters like presence of MTR station, level variation, vertical transitional spaces the spatial configuration has significant effect on the patterns of community space use in high-density compact built environment.

33-3 Physical Deterioration of Urban Housing in Yangon Central Business District and Impacts on Social dimensions of Sustainability

Su Su and Swe Swe Aye, Department of Architecture, Yangon Technological University, Yangon, Myanmar

In Yangon Central Business district (CBD) Area, 43 percent of central area housing stocks were constructed before 1943, another 43 percent were built between 1943 and 1953 and only 14percent were built after 1953. The main reason for lack of maintenance of housing stock was "Rent Control Act" promulgated in 1947. In general, old buildings' dedesigns provides very narrow walk-up apartments around 12.5ft wide by 40ft to 60ft deep. They face a street on the front and service alley on the back. Flat areas are around 600ft² on the average but due to original roof height of 12ft to 14ft, significant extensions occur. Narrow wooden steep stairs lead to 2 flats per floor is the most common style in CBD. The improvement actions in the field of maintenance of housing, water supply and sanitation are urgently needed for these housings. Within the inner urban area the major shares of employment opportunities and social amenities are the highest although some of the buildings are very old and even dangerous for human habitation. High population densities, inadequate recreational facilities and increasing number of economic activities have impacts on social dimensions of sustainability-especially on quality of life of local communities.

33-4 Sustaining Human Ecology and Social Development in Large Public Housing Estates: Australian Multicultural Experience

Aida Morden, University of New South Wales

The Housing Authority is the largest provider of affordable housing in Australia. The Department of Housing in New South Wales, the largest housing authority among the five states and 2 territories, owns and manages 142,000 housing stocks; meeting the housing needs of 334,000 people.

The Department of Housing has a history of a strong commitment to the principle of equity in access to public housing. The Aboriginal and Torres Strait Islander (ATSI) Housing Office has been set up solely to provide housing access for indigenous people and its "Ethnic Affairs Policy Statement [EAPS]" provides a policy platform for targeting clients from diverse cultural backgrounds.

However, an increasing resentment has emerged in the mainstream population who feel that they are victims of unequal and unjust policy. These are the majority whose income is just a little above the income eligibility for public housing and way below the comfortable income level of the middle class. There is a reluctance to appreciate that being housed in public housing is clear evidence that most people from cultural and linguistically diverse backgrounds are disadvantaged and require government support to maintain their basic living standard. The paper will present the effects of increasing stigmatisation in large public housing estates and effects of the "residualisation" of public housing and the concentration of the most disadvantaged to a single visible geography of largely stigmatised public housing estates.

33-5 Sustainable Public Housing Policy: Australian Multicultural Experience

Aida Morden, Bill Randolph and Bruce Judd, University of New South Wales, Australi

Australia is a "homeowners country" and the great Australian dream is to own one's home. This dream is transformed into reality as Australia becomes the third country in the world with the largest number of the population owning or purchasing their homes. More than 70% of the 20,497,458 population live in a house that they own or are buying and only slightly less than 30% do not own the house in which they live in and are renting. The Housing Authority rents homes to 5% of those renters. As Australia's rental market is predominantly comprised of single landlords, generally owning one property, the Housing Authority is the largest provider of rental housing in Australia. The New South Wales Department of Housing, the largest housing authority among the six states and two territories, owns and manages 142,000 dwellings, meeting the housing needs of 334,000 households. The NSW Department of Housing has a history of strong commitment to the principle of equity in access to public housing. The Aboriginal and Torres Strait Islander (ATSI) Housing Office has been set up solely to provide housing access for indigenous people and its "Ethnic Affairs Policy Statement [EAPS]" provided a policy platform for targeting clients from diverse cultural backgrounds. In 1999, the Department reported that 35% of tenants were from Cultural and Linguistically Diverse (CALD) backgrounds. These tenants were allocated 13% of Department staff whose first language was not English; the Non-English Speaking Background [NESB] staff members providing information sessions to tenants and clients seeking access to housing in 14 languages. The access services, provided by the Department of Housing, have contributed to the large number of persons now benefiting from affordable and secure housing, which many would argue, would not have been accessible without the government's commitment to equality and social justice. However, an increasing resentment is emerging in the mainstream population who feel that they are victims of unequal and unjust policy. These represent a section of

the majority whose income is slightly above the income eligibility for public housing and way below the comfortable income level of the middle class. There is a reluctance to acknowledge that being in public housing is likewise a clear evidence of the economic faced by most people from cultural and linguistically diverse backgrounds.

In 2005, the New South Wales Department of Housing embarked on wideranging reforms to public housing. The reform package named "Reshaping Public Housing," is set to constrict the "equal opportunity space" and further exclude eligibility to access public housing by focusing on "people with special needs": defined as the "young, the elderly, Aboriginal people and people with disability". Most conspicuously, "people from diverse backgrounds" were removed from the eligibility criteria. In 2004-2005, the Department's Annual Report revealed that, of the total population, housed in that year, 74% were people with special needs.

34-1 Stakeholder participation and networking in sustainable development

Michelle Boehme, North-West University (Potchefstroom campus), South Africa

Rustenburg (city in North West province) is one of the biggest growth points in South Africa when it comes to platinum mining. Due to the speed of these developments there are some fears that sustainable development might not occur in a systematic, planned fashion. Some of the problems currently experienced are informal settlements, migrant workers, pollution, prostitution, HIV/Aids and a lack of sufficient amenities. The most prominent stakeholders/role players that can help solve these problems and contribute to sustainable development are business, local government and the community as these problems affect all three these role players in one way or another.

In the light of all the above-mentioned a case study was done that focused on the first step in the establishment of a tripartite partnership in the Rustenburg platinum region. The aim of this case study was to see if a symbiotic relationship between these diverse role players could be established and how willing these role players would be to cooperate, what they would expect to gain from a networking partnership, what they would be willing to contribute as well as how they would envision the format and structure of this partnership on a operational level. Previous obstacles that occurred when these role players tried to work together were also listed and some broad guidelines and norms for setting up this partnership was gathered.

The study is based on how the diversity within and between business & labour, government and the local Rustenburg community can be harnessed and harmonized to increase innovation and solve shared social, economic and environmental problems that in turn would lead to the sustainable development of the total region.

34-2 Learning Interdependence and Mutual Trust in Environmental Policy Integration - three cases of urban transport governance

Carsten Jahn Hansen, Department of Development and Planning, Aalborg University

This paper highlights and discusses governance aspects and collaborative practices in relation to three cases of environmental integration in urban transport policy and planning. In each their way, the cases of Lund (Sweden), Groningen (the Netherlands) and Aalborg (Denmark) illustrate that environmental policy integration is very much an issue of managing policy processes and of conflict-handling; and hence of *how to do* rather than *what to do*. In particular, the cases offer illustrative examples of the importance of interdependence and trust between policymakers and influential actors in processes dealing with environmental policy integration. The cases support prescriptive conclusions that interdependence and trust should be viewed and dealt with as transformative processes. Trust and interdependence, and in particular the actors perception of interdependence, can itself be transformed, developed or established through interactive and more open policy and planning processes. Interdependence and trust can be learned, changed or adjusted through deliberative policy and planning processes. Hence, the cases indicate *how* environmental policy integration may be eased through an increased attention to the policy process itself; in particular through the facilitation and mediation of more interactive, collaborative and deliberative modes of conflict resolution and of collective learning.

34-3 Researching development practice as a complex learning process

Christopher David Nelson, Paul Bryce and Juliet Willetts, Institute for Sustainable Futures – University of Technology, Sydney (UTS)

There is clearly an overlap between sustainable development initiatives and learning processes. Indeed, learning is fundamental to most outcomes. This paper applies education methodologies to the development context to explore the link explicitly. We provide insight into how the concept of sustainable development can be enhanced through the application of concepts and theories that were originally developed to investigate learning processes. Specifically, we examine how *activity theory*, *variation theory* and *phenomenography* are able to usefully inform development research and enhance its potential to contribute towards the challenges of sustainability in a practical context. The paper uses a case study of a large scale agricultural project in Northern Mozambique to illustrate how explicit knowledge of the learning process can lead to better application design. We wish to point out that applying insights available from research into learning processes can improve the developmental outcome, and encourage a sustainable result. The experience of recipients and stakeholders in this project, recorded through a phenomenographic process, show how research using established educational and learning approaches can provide a framework for successful and sustainable project outcomes. These observations advance the growing support for participatory methodologies to situate development practice as a sophisticated learning process. In addition, this

example demonstrates how the use of research frameworks from diverse fields and disciplines can provide fresh insight into development research. The difficult quest for workable models towards sustainability, particularly in the developing world, demands assistance from such intellectual imports.

35-1 Why Any Substantial Definition of Sustainability Must Fail - and Why This Is a Good, not a Bad Story

Paul Burger, University of Basel

Ever since the political idea of sustainable development has become influential, scientists have tried to work out definitions for sustainability. The rationale for striving for definitional clarity is quite obvious. A definition seems to be able to fulfil two central tasks. On the one hand it could function as the (or a) core element for scientific theory building. On the other hand it could function as the (or a) core element for directing human activities within a framework of sustainability management. The former promises sustainability science to become an accepted member of the international community of "exact sciences" allowing to work out scientifically sound solutions. The latter promises actors to escape the realm of subjectivism, because it will no longer be able to refer to individual interpretations and preferences in and for decision-making.

The paper argues, however, that although striving for definitional clarity is understandable, it is substantially inadequate:

1) A definition has to fulfil formal requirements and is nominal or real. A nominal definition, however, will not do the job, because nominal definitions are related to discursive contexts and will therefore lack generality. We have to look at a real definition by presupposing that there is a societal state of affairs identifiable as being sustainable according to objective criteria.

2) There are serious objections. The first stems from the definitional component of inter- und intragenerational justice. Although there is no point in claiming that "anything goes", it is widely accepted within ethics and societal theory that there is no such thing as a set of objective material criteria for justice. Material justice cannot become defined, but is something like a permanent object for societal deliberation. Accordingly, one of the formal criteria – to state necessary and sufficient conditions – cannot be met. The second objection stems from the structure of modern society. According to the theory of functional differentiation each subsystem follows its objectives according to its societal function (e.g. education), its codes etc. A real definition for sustainable development would amount to an insight to the right structured and balanced global system of subsystems – a claim that strongly resembles Plato's political theory that there is something like a just natural order of things.

Do we have a problem in sustainability science, if we are not able to give a substantial definition of sustainability? Surely, scientist's capacity to develop top-down approach to objectives of societal developments will be restricted. However, the paper argues that this is more beneficial than obstructive:

3) The lack of material generality is not to be confused with "anything goes". Firstly we have a remarkable amount of methods such as system analysis, material flux analysis, economics, social sciences etc. Secondly, we have structural approaches like Dobson's typology or the capital account. Moreover, we have proposals for an integrated set of general postulates encompassing justice and the social dimension.

4) Scientific theory has to be at least empirically adequate. The openness of society and the democratic participation of its citizens is part of the object in question. A theory of sustainability that does not represent the openness of human society carries the mark of falsehood. Moreover, the openness within sustainability theory makes it easier to cooperate with societal actors by accepting the functional difference between decision-makers and decision-making-supporting scientific work.

35-2 Prospects and Challenges of Pursuing Sustainable Development on South-South Basis

Nim Dorji, Sustainable Development Secretariat (SDS)

As a tangible follow-up to the Rio Earth Summit and to implement Agenda 21 to promote sustainable development, a partnership was launched in 1994 between the Netherlands from the north and Benin, Bhutan and Costa Rica from the south. Equality, participation, and reciprocity were the guiding principles. Despite their economic, ecological, social and cultural differences, the partnership has achieved concrete results. Further, as a step forward, Benin, Bhutan and Costa Rica, forged a strategic partnership to continue their pursuit of sustainable development on a South-South basis at the World Summit on Sustainable Development in Johannesburg in 2002. Policy dialogue, sharing of experiences and expertise; replicating and extending successes, establishing partnerships between civil societies organizations are the main objectives. The paper will present the prospects and challenges of pursuing the goals of sustainable development on south-south basis.

35-3 Global environmental change and human health: A framework for vulnerability assessments

Henk Hilderink and Paul Lucas, Netherlands Environmental Assessment Agency (MNP-RIVM)

This paper describes an operationalisation of the term 'sustainable development', by introducing the vulnerability concept. Vulnerability describes the degree to which a system is likely to experience harm due to exposure to a hazard, and thereby identifies unsustainable states and processes. The operationalisation is presented in a framework, which incorporates the three elements of vulnerability, i.e. exposure, sensitivity and coping capacity. The framework links model outcomes resulting in an overall measure of sustainability of a certain sector or system. The overall vulnerability is determined by the potential impact (exposure plus sensitivity) and the coping capacity,

which is the impact that may occur given projected global change and the degree to which adjustments in practices, processes or structures can moderate or offset the potential for damage. The advantages of the approach are the transparency of the indicator framework and the linkage of the framework with simulation models. The methodology has been applied to food security as one of the main human health issues. This resulted in a measure for the overall vulnerability of countries to food shortages. Next, other health issues, such as drinking water and sanitation, malaria and air pollution are included in the vulnerability framework to identify health-threat hotspots and to gain insights in the underlying dynamics of vulnerability.

36-1 A Total Quality Management (TQM) approach to determine an industrial sector's sustainability - a New Zealand electricity industry case study.

Bernard Cho Ming Cheng and David I. Wilson, Auckland University of Technology, New Zealand

The quantification of such an elusive concept as sustainability is hampered by the difficulty to agree on a common metric to measure it. This paper proposes tools to establish such a metric. First, sustainability issues are analysed and categorised using an Affinity Diagram and the inter-relationships between the stakeholders identified through a Systems Diagram. In order to monitor the development of these issues and the effectiveness of their solutions, indicators are developed and rating methods for them are defined. To assist the stakeholders to interpret the data, indicators are grouped according to sustainability dimensions identified through a Tree Diagram. The indicators are put into a Matrix Diagram and the median values are taken to deliver a scalar sustainability metric which are organised according to stakeholders' interest. This framework can play an important role in the Plan-Do-Check-Act Cycle of improving sustainability. Its unique nature allows issues to be clearly identified and prioritised, indicators rated as seen fit by the users, progress monitored and results organised in a way to deliver meaningful information to the stakeholders. This paper uses the New Zealand Electricity Industry as a case study to show the flexibility in a complex, multifaceted sector. We are not proposing we can solve the sustainability issue once and for all, but suggest this framework is one of the effective ways to reveal the state of health of the industry sector.

36-2 Corporate Sustainability: Developing the Business Case

Rupert J. Baumgartner, Department of Economics and Business Management, University of Leoben

Corporations have to play as societal actors an important role in the development of sustainable societies. Additionally, Corporate Sustainability can be a source of competitiveness and economic success. But it is essential to explore the specific chances and risks for each company - it is necessary to identify its specific business case. Based on a critical analysis of the scientific discussion this paper presents a general methodology for this task. It consists of following phases:

- Analyzing phase
 - o External aspects (sector and market conditions, stakeholder requirements)
 - o Internal aspects (strategic position, stakeholder requirements, organizational culture, managerial capacity)
- Planning and strategy development phase
 - o Scenarios
 - o Goal setting
- Implementation phase
 - o Controlling
 - o Continuous improvement

Within the analyzing phase, the company is assessed regarding its status in the light of Sustainable Development including relevant internal and external aspects. On this basis, strategies, measurements and goals have to be developed within the planning and strategy development phase. Controlling and continuous improvement supports the implementation phase. All phases are supported by management instruments (for instance portfolios, (Sustainability) Balanced Scorecard, seven new tools). A case study about a producer of boiling systems shows the practicability of this concept.

36-3 Social Audit As a Mechanism to Assess and Report on Corporate Sustainability

Jane Zhang, Napier University

Social auditing has received much attention in the literature and its potentials are well documented. This paper examines the concept of social auditing, identifies the applicability of social auditing as an approach to engaging stakeholders in assessing and reporting on corporate sustainability and its performance. This paper has examined the role of dialogue-based social auditing in helping business to move towards sustainability. The foundation of underlying the role of social auditing in the process of corporate sustainable development is the complexity of stakeholder relationships. Globalisation, deregulation and liberalisation are driving corporations to base their competitive advantage on sustainability policy. A corporation performance increasingly depends on its relationships with key 'stakeholders' and partners. Trusts, commitment and co-operation amongst stakeholders and corporations are key elements in this process but are often missing in the equation for successful and sustainable businesses to create successful and sustainable societies. This paper has argued that social auditing as a process of accessing and reporting on corporate social and environmental performance could be applied to build trusts, identify commitment and promote co-operation amongst stakeholders and corporations.

36-4 A Sustainable Industries Performance Indicator Framework

T.E. Casavant, Eco-Industrial Solutions Ltd

Sound decision-making depends on our ability to measure our performance, allowing us to learn and adapt from our successes (and failures). Performance indicators help us to measure our performance in a systematic, consistent, and rigorous way.

The lack of measured (or measurable) results has been a barrier to successful implementation of eco-industrial networking (EIN) (and the development of eco-industrial parks) across Canada. Standardized, rigorous measures facilitate the tracking of costs and benefits of innovative solutions like EIN. While anecdotal evidence and descriptions of the benefits are motivational, quantitative, demonstrable benefits are an effective means to engage the business community and secure financing to implement EIN.

A review of eco-efficiency and sustainable community indicators found that none were able to provide a complete picture of sustainability performance of industrial areas. The framework outlined in this paper brings together and adapts the reviewed indicators, so that they can be applied to measure the sustainability of industrial or business parks. The paper focuses on those indicators that could be normalized to provide for meaningful comparison from site to site, and for which data was likely available.

36-5 Business and Community Based Rehabilitation (CBR): A creative alliance for sustainable development in China?

Trevor William Goddard¹ and Sheila Purves², (1) Centre for Research into Disability and Society, Curtin University of Technology; (2) Hong Kong Society for Rehabilitation

Business success and the health of community citizens can not exist in isolation, their development is interdependent. A mutual understanding of each others goals and endeavours is critical for social and economic development to occur concurrently.

The Hong Kong Society for Rehabilitation (HKSR) is a non-profit, World Health Organisation collaborating centre that supports development of CBR in China. Their mission is restoring health and contributing to the economic self-sufficiency of China by enhancing community service capacity to provide services to Chinese people with a disability, chronic illness and general public. They do this across services including; accessible transport, education and advocacy, wellness and community rehabilitation, vocational rehabilitation and long-term care. The aim is to assist people re-construct their lives in the spirit of the phoenix, the HKSR emblem, by becoming active citizens in their local community.

This paper focuses on service delivery in China, demonstrating how creative business investment in community health might allow for the exchange of expertise, resources and knowledge. It profiles how the business need for a healthy Chinese society might be met by supporting organisations such as HKSR in dealing with complex social health issues; contributing to the sustainable development of business and society.

37-1 Life Cycle Assessment of a Building Insulating Biomaterials. A case study on the keba-fibre thermo insulating board

Fulvio Ardente, Giorgio Beccali, Maurizio Cellura, Marina Mistretta and Orioli Aldo, Dipartimento di Ricerche Energetiche e Ambientali

This paper presents a Life Cycle Assessment of a keba-fibre insulation board following the international standards of series ISO14040. Each life-cycle step has been checked, from kenaf production and board manufacture by an Italian firm, to installation and disposal. The aim is to assess the board eco-profile and to compare, on the basis of a life-cycle approach, the energy and environmental benefits and drawbacks related to its employment into a exemplary mono-familial house.

The study focuses also on processes and input materials which are responsible of the main environmental impacts of the product, and locates critical issues and the life-cycle steps with the highest improvement potentials.

37-2 Analyzing and Modeling of Life Cycle Assessment Database System

Yaping Zhang and Yuhui Zuo, Environment Department, Nanjing University, China

The complexity of life cycle assessment, variety of data sources and onerousness of data transactions mean that computer software would be an effective tool which can't only deal with data accurately and quickly but also store information. Based on the Related Database Theory, a life cycle assessment database system was designed. According to different types of data used in LCA, data were categorized into four classes: product assessment data, product dossier data, basic material data and impact assessment basic data. Four databases were designed and structures and models of these databases were established.

37-3 Combined Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) Study on the Sustainability Performance of a Public Housing Block in Hong Kong

Alex Amato and Felix Yat Hang Wong, Department of Architecture, The University of Hong Kong.

In 2004 a consortium comprising of the University of Hong Kong's Department of Architecture, Davis Langdon & Seah Management Ltd., and the Business Environment Council completed a combined Life Cycle Assessment (LCA) / Life Cycle Costing (LCC) Study for a 40-storey concrete-framed HKHA (Hong Kong Housing Authority) public

rental housing block – New Harmony Block (Option 2) (NHB). The study first quantitatively measured the following ten environmental impacts generated and life cycle costs incurred from the 155 functional units of the NHB block in the whole building life-cycle perspective, including (1) initial stage including raw material extraction, building material manufacturing and transportation stage; (2) construction; (3) building operation; (4) repair and maintenance, and (5) disposal stage:

1. Energy (MJ)
2. Resource depletion (kg)
3. Water consumption (m³)
4. Waste (kg)
5. Climate change (kg CO₂ eq.)
6. Acid rain(kg SO₂ eq.)
7. Photochemical smog (kg C₂ H₄ eq.)
8. Ozone depletion (kg CFC-11 eq.)
9. Toxicity to humans (kg toxic eq.)
10. Toxicity to ecosystems (kg toxic eq.)

This paper will report the following LCA and LCC result of the study, including:

1. The LCA and LCC “hotspot” functional units amongst the 155 functional units of NHB
2. The LCA and LCC “hotspot” life-cycle stages amongst the five life-cycle stages in analysis
3. Some of the key LCA and LCC improvement study with alternative materials

The paper will also discuss the future application of the combined tool in the assessment of sustainability performance of other building types and its potential for encouraging improved sustainability in existing and future building stocks in relation to the development of a sustainable city.

37-4 The Integration of Health Impact Assessment (HIA) Module with a Combined Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) Assessment Tool for Public Housing in Hong Kong

Felix Yat Hang Wong and Alex Amato, Department of Architecture, The University of Hong Kong.

In 2002, the Hong Kong Housing Authority (HKHA) commissioned a consortium comprising of the University of Hong Kong, Department of Architecture, Davis Langdon & Seah Management Ltd., and the Business Environment Council to undertake a combined Life Cycle Assessment (LCA) / Life Cycle Costing (LCC) Study of a HKHA public rental housing block - New Harmony Block 1 (Option 2) (NHB). The main goal was to create a decision making tool to measure the financial implication and environmental impacts of selecting 110 alternative building materials from the standard specification. The tool measures the following ten environmental impacts generated from the whole building life-cycle stages including, raw material extraction, building material manufacturing, construction, transportation, building operation, repair and maintenance, and disposal:

1. Energy (MJ)
2. Resource depletion (kg)
3. Water consumption (m³)
4. Waste (kg)
5. Climate change (kg CO₂ eq.)
6. Acid rain(kg SO₂ eq.)
7. Photochemical smog (kg C₂ H₄ eq.)
8. Ozone depletion (kg CFC-11 eq.)
9. Toxicity to humans (kg toxic eq.)
10. Toxicity to ecosystems (kg toxic eq.)

The result showed that NHB block generated 1.54 HK E-points/construction floor area (CFA) and cost HK\$ 18040.46 /CFA (US\$ 2313.08 /CFA) for the whole 55-year building life-cycle. The tool did not assess social dimension of sustainability, including health advantages / disadvantages, at the moment.

To assess the health dimensions of building life-cycle, this paper proposes a health impact assessment module for the existing combined LCA and LCC decision making tool. Four types of quantitative health indicators will be used to measure quantitatively the non-communicable disease burden of indoor emission from building materials on workforces and occupants in New Harmony Block. The paper will use radon emission and health effect assessment as an example and demonstrate the combined decision-making process on the choice of building materials for panel wall – internal (partitions), one of the 155 functional units, in New Harmony Block (Option 2) on the reduction of lung cancer risk. The final tool will be a combined LCA, LCC and Health Impact Assessment (HIA) decision-making tool to measure the financial implication, environmental impacts and health effects of selecting 110 alternative building materials for 155 functional units in public housing in Hong Kong. The study is work-in-progress

38-1 Institutional strengthes and barriers to apply the environmental negotiated agreements in China

Hans Th. A Bressers and Yanyan Xue, Clean Technology and Environmental Policy Center (CSTM) / University of Twente, the Netherlands

Environmental negotiated agreements have been practiced in some industrialized countries for decades, but still appear a new option to Chinese policy makers and implementers. To answer the question whether it is politically feasible to introduce NA into China's environmental management regime, this paper develops a three-layer analysis scheme based on previous research and applies it to China's situation as a context for negotiated

agreements. For this, we theoretically argue that a country's background context is crucial to be considered when analyzing the feasibility of adopting NA because the background deeply influences the formation of network relationships and institutions, which shape the individual actor's motivation, perceptions and resource availability in many aspects. These actor characteristics directly affect the success of NA at case level. Empirically, we find China has in principle a rather favorable big background to accept NA in the four dimensions we discern: environmental, political, economical and cultural context. Furthermore, we identify three basic favorable institution mechanisms to affect governments' motivation at the network level: the Environmental Responsibility Target System, municipal Environmental Committees and the Green GDP index system. In case analysis, we find the local government is still not fully motivated to mobilize the resources and information due to the experimental features of the agreement. As conclusion, we propose that more concrete institutional mechanisms need to be arranged to improve not only the motivation of local government but also the industry's motivation, perceptions and resources availability to ensure the success and effectiveness of negotiated agreements.

38-2 Impediments in Implementing Euro III Norms in India

Arun Aditya Sahay, Center for Environmental Management, Management Development Institute, India

The erstwhile order of the Supreme Court, disallowing registration of private noncommercial vehicles failing to conform to Euro II fuel emission norms, in the National Capital Region (NCR), from 1 April 2000 onwards, had added a new dimension to the public debate on eco-friendly and sustainable urban transport systems. An area that was neglected in this new debate was the role that fuels such as petrol and diesel would play if new cars were to meet the Euro IV norms in near future in metro cities. The background of Supreme Court's order on environmental issues and acceptability by the automobile manufacturers to produce vehicles that adhere to Euro IV norms raise an important question: Will the petroleum and automobile industries be able to agree on a common goal for automotive emission standards? What will be social reaction and how will the Govt. tackle it? The present article, after giving brief history, discusses about the legal, administrative, social and technological aspects of implementing Euro III all over India and Euro IV in Metro.

38-3 Industry Responses to EU WEEE and ROHS Directives: Perspective from China

Jieqiong Yu, Peter Hills and Richard Welford, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

The electrical and electronics (EE) industry has come under increasing pressure to adopt extended producer responsibility (EPR) policies through the introduction of the European Union's Directives on Waste Electrical and Electronic Equipment (WEEE) and the Restriction of Use of Certain Hazardous Substances (ROHS). Based on the findings of 50 questionnaires and in-depth interviews with China's EE manufacturers conducted during the 2nd half year of 2005, this paper investigates the perception and readiness of WEEE and ROHS in China, identifies key difficulties encountered by manufacturers in fulfilling the requirements, and evaluates the effectiveness of these two directives in promoting environmental reform. The findings indicate that the extent of companies' responses to WEEE and ROHS largely depends on their market structure and client requirements. Supply chain management, raw material testing and cost implications appear to be key challenges in addressing issues surrounding the directives. Furthermore, WEEE attracts much less attention than ROHS in China, and there is little evidence to suggest that these directives have effectively driven China's EE manufacturers towards systematic eco-design.

39-1 Measurable social sustainability indicators in the building environmental assessment tools: Hong Kong's Public Rental Housing (PRH) as a case study

Mohammad Faruk and Alex Amato, The University of Hong Kong

The construction industry represents one of the largest enterprises in the world. Undoubtedly it plays a major role in the overall sustainability of the world. Awareness for construction related sustainability has given birth to many building environmental assessment tools; i.e. BREAM, LEEDS, CASBEE, HKBEAM etc. These tools measure two of the three recognized environmental aspects of sustainability; economics and environment using LCA (Life cycle analysis) and LCC (Life cycle costing) methodologies. Measurement of social sustainability is left out of these tools mainly due to the absence of an established consensus of which social sustainability indicators are relevant and the relative weighting between each of the indicators. This paper proposes to identify the key social sustainability indicators for any future building sustainability assessment tools specifically looking into refurbishment or comprehensive redevelopment work related to housing. This study looked into the ageing population scenario in HK and used the ageing PRH tenants as stakeholders to identify the key social sustainability indicators related to future refurbishment or comprehensive redevelopment.

39-2 Tools for assessing the sustainability of housing development: indicators and criteria

Rebecca Lai Har Chiu, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

Sustainability indicators have been developed to ascertain baseline conditions and to monitor the sustainability of developments. This paper aims to critically evaluate the use of indicators and criteria for assessing the sustainability of housing development. The first part of the paper will discuss the approaches taken to develop the sustainability indicators and the strengths and limitations of the indicators approach. It will point out the need for the use of both quantitative and qualitative indicators. It will also stress the importance of distinguishing sustainability indicators from sustainability criteria. The second part of the paper will specifically discuss

sustainability indicators and criteria suitable to evaluate housing development, covering the environmental, economic, social and cultural aspects. It will finally evaluate the housing-related sustainability indicators used by the government of Hong Kong.

39-3 Potential of Electricity Savings of Buildings in Warm-Humid Climate

Matthias Haase and Alex Amato, The University of Hong Kong

There is a world-wide need for a sustainable development. About 50% of energy is used in buildings. Warm-humid climate with is predominant in South Asia. Detailed analysis of the weather conditions and their main characteristics has been evaluated indicating evitable cooling in this climate. A mechanical ventilation and air conditioning (MVAC) system is usually operated to get rid of the cooling loads.

An ecological building design strategy is proposed that consists of a three steps approach; energy conservation, increasing energy efficiency, utilizing renewable energy. The energy conservation process should start at the building design stage. Six established energy conservation strategies in the design stage have been evaluated for 8 different locations in Asia. The potential for a building design which integrates climate responsive building elements with an innovative building envelope system in order to decrease the need for mechanical ventilation and air-conditioning has been calculated. Then an analysis of energy consumption pattern in 8 different countries was used to further calculate the energy conservation potential.

It could be shown that up to 61% of the energy used for ventilation in buildings can be conserved in warm-humid climate. This façade design can help to develop energy responsible buildings in Asia. Furthermore it reduces significantly the use of electricity and can have an important influence for further developments of sustainable buildings in Asia.

39-4 Double-skin Facades and Airflow Windows For Energy-efficient Building Design

Matthias Haase and A. Amato, The University of Hong Kong

The Hong Kong climate is sub-tropical with hot and humid weather from May to September and temperate climate for the remaining 7 months period. A mechanical ventilation and air conditioning (MVAC) system is usually operated to get rid of the high peak cooling loads. Previous studies reported that for 80% of the year the minimum air change rates could be naturally supplied during the 8am-8pm day by using a solar chimney. In this report the development of an innovative ventilation system which integrates climate responsive building elements with an innovative building envelope system were investigated. This resulted in further integration of a climate responsive façade and an energy efficient MVAC system. CFD and thermal building simulations were carried out in order to identify the main design variables of airflow window and solar chimney and its influence on the overall energy consumption. Especially interesting was the attempt to reduce the high peak cooling loads during the summer period by controlling the exhaust airflow using a climate sensitive regulator. It could be shown that up to 29% reduction of peak loads can be achieved. This results in significant energy conservations and a reduction in systems cooling size

40-1 Identity and Sustainable Renewal of the Main Street

Aleksandra Djukic and Eva Vanista-Lazarenic, Faculty of Architecture University of Belgrade

The main subject of the papers is about describing identity through physical structures which present collective memory of the citizens and creating the design tool for urban renewal of the main streets in the Serbian towns. The purpose of the tool is to provide urban designers with information and ideas on the possibilities for the sustainable development of existing main streets in the historical part of the towns. It helps identify alternatives and limitations with regard to sustainable renewal of existing urban structures. The goal is to use results of theoretical research in order to make new model, based on elements we can learn from the past. The model is based on understanding the main principles and rules through the history, which created the physical structure of the main streets. Transformation process of main streets is very significant for our and European towns, because each town contains only one main street (the market one) and no matter processes of enlarging development and city structure transformation. The second reason is reflected in the significance of public places at the city level and in offering chance to those spaces to get back the ultimate significance they had in the past. The design tool is primarily intended for use by urban designers and local government policy officials who are involved in urban renewal projects and it may help them to bring to citizens and open urban space consumers the attraction, harmony and "the sense of belonging to space".

40-2 A Sustainable City - Where has our Heritage gone?

Hon Meng Wong, HK Institute of Planners

The concept of Sustainable Development embraces three main elements, namely the environmental, the economical and the social aspects. A large amount of discussions in the past few years on sustainable development were focused on economical and environmental issues, seemingly the social aspect has been overlooked or at least given less attention. For a metropolitan like Hong Kong, even with good economic progress and not too bad an environment, without its heritage being protected and flourished, it is rather difficult to classify Hong Kong as a real leading international and sustainable city. Unfortunately, in the past decades of rapid development in the

region, Hong Kong witnesses her own heritage being destroyed, despite efforts in preserving some individual historic buildings.

Protecting a city's heritage is not something new in the western world. Many efforts have been made to integrate heritage conservation with town planning and policy making. Decision tools have also been put forward, for instance, under the European Union's (EU's) project for "Sustainable Development of Urban Historical Areas through an Active Integration within Town", a set of guidelines have been developed and published in 2004 entitled *"Guidance for the Environmental Assessment of the impacts of certain plans, programmes or projects upon the heritage value of historical areas, in order to contribute to their long-term sustainability"*.

This paper will investigate into the Hong Kong situation and explore, with examples, on how heritage conservation, town planning and related policy formulation could be integrated by means of a strategic assessment process, thus sustaining the very unique heritage of Hong Kong.

40-3 Inhabiting the Archipelago: Towards the construction of the Urban Green Building Tool - Venezuela

Mercedes Ferrer y Arroyo, Instituto de Investigaciones Facultad de Arquitectura y Diseño Universidad del Zulia

The objective of the paper is to present the selected urban sustainability indicators (USI) to evaluate the contemporary forms of making city, which result from the visible management government (VMG) in metropolitan Maracaibo, referred as an archipelago (MAM). With this purpose, the VMG and the MMA were characterized as processes of government and territorial fragmentation directed to overcome the asymmetries in the quality of life and urban poverty, as well as the government and the intelligent city (IC), to establish the link between sustainability and knowledge/intelligent society. Other study cases were revised and the ISU selected, relating the attributes-characteristic of the VMG-MAM with the model Pressure-State-Response (PSR). The paper concludes proposing USI to formulate the Venezuelan Urban Green Building Tool (UGBTool), using the *extensive concept of sustainability* and, pointing out, the need to transform the VMG in a VMG Intelligent and Innovative (VMGI+i), capable of mobilizing the participation of the three levels of government and urban actors in the formulation of a shared project for the city and promote through a creative leadership, partnerships with the enterprising and innovators agents of Venezuela, to transform the MAM in a sustainable "Mancommunity" of cities and citizens.

40-4 Social Impact Assessment of Urban Renewal Projects in Hong Kong

Kwan Kwok Leung, Quality Evaluation Centre, City University of Hong Kong

Social impact assessment (SIA) has been a major concern for Hong Kong's Urban Renewal Strategic Plan to clarify problems concerning housing, crowding, the availability of amenities and community facilities, work and employment, social networks, and other special needs. This study aims to examine the reactions and psychosocial well-being of residents directly affected by the renewal plan, their neighbours as its major concerns, and other stakeholders including policymakers, land developers, and interest groups. This study also investigates other significant factors arising from urban renewal that are conducive to residents' adjustment and well-being. According to analytical findings based on seven case studies of urban renewal in Hong Kong, residents affected by the renewal (i.e., required to remove) did not significantly differ from neighbours not affected by the renewal (i.e., not required to remove) in morale and reactions to the renewal. One implication is that residents did not experience particularly greater impacts from the renewal. Another implication is that residents and their neighbours were similarly affected by the renewal. This implication is likely in that the neighbours had no insulation device to separate them away from the renewal project. Residents and neighbours were thus on the same boat floating on the water contaminated by the renewal project.

41-1 Globalization and Sustainable Development: Reconciling the Irreconcilable?

Ravi Nunna Srinivas, University of St. Thomas

The last two decades of the 20th century witnessed the consolidation of the global environmental agenda under the banner of sustainable development. This consolidation represents a global political consensus on the need for adopting comprehensive strategies to attain the twin objectives of environmental protection and economic development. Design and implementation of strategies for sustainable development are affected by patterns of global interdependencies, interconnections and impacts stemming from the globalization processes.

The first part of the paper focuses the multidimensional nature of contemporary globalization (since 1970) in order to identify the characteristics of the globalization processes and their implications. The second part of the paper focuses on sustainable development and starts with a critical examination of the global sustainable development agenda. The key actors and institutions involved and their role in the process of implementation will also be reviewed. The third part of the paper assesses the extent to which globalization impedes or furthers sustainable development. In particular, the focus is on the ways in which globalization forces and processes have influenced current thinking on and the implementation of the sustainable development agenda. The paper concludes with an assessment of the prospects for realizing sustainable development in an increasingly globalized world.

41-2 Another Strategy to Assess Sustainable Development

Yun-feng Chen¹, Gen-fa Lu¹, Jie Qi², (1) Nanjing University; (2) Huazhong University of Science and Technology

The goal of sustainable development is to preserve sustainability and simultaneously prevent catastrophe in a man-land system. However, almost all the existing approaches of assessing sustainable development are to measure the sustainability, namely appraise from the obverse side of the sustainable development. So it seems necessary to attack the same task on the reverse, that is to measure the possibility of catastrophe. In this paper, with a case study of Tianjing, China, we employ catastrophe theory and models to integrate Tianjing's sustainable development indicators, and then deduce the catastrophe risk index (*CRI*) to present the level of catastrophic possibility in the city. Applying catastrophe theory is a new strategy to assess sustainable development and shows great practical significance, especially for those developing regions or countries, who always give more priority to their economy and therefore have more obligation to make sure whether their social economic activities might bring forth any ecological environment catastrophe. Besides, being both qualitative and quantitative, the approach could be employed to explore not only static characteristics but also dynamic mechanism of man-land system. Although our work is only a maiden attempt and still calls for further effort to improve it, the case study of Tianjing in this paper would assure us the great promising future to apply catastrophe theory to sustainable development modeling.

41-3 Building Our Sustaining World

Aaron Mathias Vallejo, The University of Hong Kong

Sustainable development has transformed from an awareness of the environmental problems, towards decreasing the damage, towards turning destructive activities into regenerative activities. Eco-efficiency, using less energy and less materials, has been useful in slowing the destruction while business comes around to a profitable and positive engagement with the natural world. Eco-efficiency is important but does not delve deep enough into industrial design. The operating system of planet Earth is abundant solar energy bathing chemistry (Earth's mass) which then springs to life creating biology. This richly diverse biology circulates endlessly around the planet. In nature the concept of waste does not exist. Similarly, eco-effectiveness asks human industry to work with the laws of nature to grow regeneration rather than less destruction. Examples of this circular eco-effective design are already going commercial and a new certification is now approving whole lines of profitable products including carpets, fabrics, chairs, concrete additives etc. What is needed now is education in the advantages Cradle to Cradle Design and realignment of business and governments to support this mutually beneficial design where our industrial systems honour all of the children of all species for all time.

41-4 *KiwiGrow*TM — a universal, ecosystem-based framework for sustainable development

Paul G. Luckman, Creative Decisions Ltd, New Zealand

*KiwiGrow*TM is a universal, easily understood matrix framework and vocabulary for sustainable development, based on ecosystem health concepts. It was created for a strategic assessment of water and sanitary services for Waitakere City Council, Auckland, New Zealand, where the requirement was for an enduring health vocabulary, equally applicable to social, economic, environmental and cultural systems, that would support a risk-based approach to accommodating uncertainty and evolving knowledge. Review of agroecosystem health literature in light of these criteria led to identification of seven qualities of healthy ecosystems: healthy ecosystems are *nurturing, supportive, stable, contributing, responsive, directed, and adaptive*. Considering these seven qualities separately in social, economic, environmental and cultural contexts provides a 28 sector matrix capable of capturing policy synergies and tradeoffs. This universal framework now provides (1) a common language and rich intellectual fabric that transcend disciplinary boundaries and policy silos, (2) a new management systems model with the potential to transform societies and economies, and (3) a "quadruple bottom line" reporting framework that can invigorate sustainability reporting efforts. The immediate need, now, is for a coordinated international research effort. This should be centred on a global network of committed early adopters and create the visions, strategies, tools, leaders, and living demonstrations that will show that *KiwiGrow*TM can underpin sustainable development for a raft of ecosystem types, such as wetlands, forests, farms, businesses, organisations, and neighbourhoods. This research effort should also aim to show how *KiwiGrow*TM can be used with landscape-scale community processes, such as integrated catchment management, to energise mosaics of these ecosystems and create sustainable cities and regions motivated by a value system appropriate for the 21st century, and which is encapsulated in a simple mantra of just seven words.

42-1 The human factor in energy policy in small island states and territories: cases from the Caribbean

Kathy E. Stuart, University of Prince Edward Island

Although there are few island-specific studies in energy literature, comparative study of islands offers a great opportunity to isolate and explore complex phenomena. This presentation reports on research documenting human factors that can affect innovation towards sustainability and energy diversity in small island states and territories. Using an inductive approach, energy institutions and policies are examined to uncover best practices linked to a range of sustainability indices. Areas of authority, cooperation and conflict between utilities, governments and regulatory bodies are explored as data is gathered in several Caribbean islands through interviews of knowledgeable élites. The study also identifies the relative importance of other facilitators or inhibitors which influence the energy institution. This may include the presence or absence of public policy institutes, educational institutions, local lobby groups, international NGO's, corporate sector, competing suppliers and charismatic individuals or consumer groups. Understanding these complex relationships may lead to the development of more effective energy institutions on islands with respect to sustainability.

42-2 Sustainable Energy Research - A changing paradigm in the future?

J. F. Hake and Regina Eich, Research Centre Juelich

For Energy Policy in the 21st century there are three trends of fundamental importance: The future of population growth, the economic development and the condition of natural resources which can be supplied. Sustainable development represents the overarching and embedding concept for a future energy policy. As this concept becomes more detailed and operationalized the question arises how R&D can provide the basis for sustainable development.

Regarding the challenge of energy supply for an growing demand it is obvious that present options are not well suited. With view of the limited capacities of the environment (GHG, radioactive waste) the stretcher capacity of the ecological systems under at present valid and practiced conditions is more than questionable.

Hence, great attention has to be paid to energy research. Therefore, energy research is the strategic vector on the way to sustainable development, in order to lower on the one hand costs of the new technologies and to reduce on the other hand the disposal problems substantially. The paper discusses the following questions:

- What are the impacts on energy research from the debate on sustainable development?
- Which topics should be covered by a sustainable energy research?
- Which financial framework is appropriate?
- Are institutional matters covered appropriately?
- What are the societal responsibilities?
- Do we need a global initiative for energy research?

So far, the topic of energy research has not yet been appropriately in the focus of the Rio Process. On the other hand a growing number of boundary conditions is derived from guiding principles e.g. SD.

42-3 Does Global Change matter? - the Case of Industries in the Upper Danube Catchment Area

Matthias Egerer and Markus Zimmer, Ifo Institute for Economic Research

Aim of the paper is to learn from the entrepreneurs' point of view, whether they expect that climate change in the long run will cause a shift in the natural water supply with negative effects on their production and output and how companies would react to that. The investigation area covers the Upper Danube river basin, a catchment in the mountain forelands of the humid latitudes that primarily includes parts of Bavaria and Baden-Württemberg in Germany and Tyrol and Salzburg in Austria. Basis of the study is a sector oriented analysis of the current use of water in industrial manufacturing processes. To analyse the entrepreneurs' assessments of the effects of climate change a questionnaire was sent to 750 firms of different sectors. About 100 companies replied. Main aim of the questionnaire is to find out, whether the extreme hot and dry summer of 2003 already had effects on the industrial production and how companies would react on more extreme climatic conditions, for example by investing in technology of multiple usage of water or by reducing production. To deepen these information representatives of selected companies were interviewed in great detail, to work out some case studies.

42-4 Factors behind change in CO₂ emissions from fuel combustion - country rankings

Jarmo Vehmas and Jyrki Luukkanen, Finland Futures Research Centre

In this paper, the authors provide an analysis of factors affecting change in national CO₂ emissions from fuel combustion based on decomposition analysis. The data used is provided by International Energy Agency (IEA) and covers the years 1973–2002. The identified factors behind change in CO₂ emission include changes in CO₂ intensity of the entire energy system (CO₂ emissions/total primary energy supply), efficiency of the energy transformation system (total primary energy supply/final energy consumption), energy intensity of the national economy (final energy consumption/GDP in real prices), standard of living (GDP in real prices/amount of population), and amount of population. The analysis covers major industrial and developing countries. The countries are ranked by different factors and the results indicate that instead of energy efficiency and technological development, structural change of the economy affecting the CO₂ intensity of the national economy is the major factor decreasing CO₂ emissions in the industrial countries. On the other hand, this effect is often counterbalanced by the increasing factor of GDP per capita, and the result is increasing CO₂ emissions from fuel combustion. In developing countries, decreasing factors are hard to find. In China, decreasing energy intensity of the economy has strongly contributed to CO₂ emissions.

43-1 Relationship between investment in environmental initiatives and firm competitiveness: A case of European textile finishing firms

Samarthia Thankappan, Cardiff University

This paper presents some of the results of a four-year study of the relationship between firm competitiveness and environmental performance and factors influencing that performance, including management environmental culture, availability and use of external advice on the use of cleaner production and the firm's environmental performance among small and medium sized European manufacturing firms (SMEs) in the United Kingdom, Republic of Ireland, Germany and Italy for three industrial sectors (furniture, textile finishing and fruit & vegetable processing). This paper examines results for the textile finishing sector. The results indicate a hierarchy of initiatives performed by firms when comparisons were made between compliance only, compliance plus and excellent environmental performers. This was also associated with a rise in the technical complexity of the initiative

adopted. However tests showed that the ability to take on these initiatives was not related systematically to R&D capacity or skills. In fact drivers for the adoption of initiatives were different across countries. In Italy regulation predominated, in UK/ROI regulation and cost were important; in Germany market pressures were much more important in bringing forth environmental initiatives. One policy implication of the research is that environmental policy towards SMEs should not be constrained by concerns over competitiveness implications. Measures of competitiveness and their relation to environmental performance are examined.

43-2 The Business and Institutional Furniture Manufacturers Association International (BIFMA)

Bennett Lloyd Rudolph and Norman Christopher, Seidman College of Business, Grand Valley State University

The Business and Institutional Furniture Manufacturers Association International (BIFMA) is the major trade association serving the office and institutional furniture industry. This organization, which has over 260 members including most of the world's leading office furniture manufacturer's and many of their key suppliers, recently adopted surprisingly strong and progressive "triple bottom line" sustainability guidelines for their voluntarily participating members. This paper describes the economic and social motives and incentives leading to the development of the guidelines, examines the specific guidelines, reviews the membership reporting requirements, and reports on the significant progress being made in this one individual industry. The paper also reports on the ongoing transition from guidelines to measurable and certifiable sustainability standards in the office furniture industry and speculates regarding the degree to which similar guidelines could be used as a template for other industries.

43-3 Exploring sustainability of the potato supply chain in the UK

Natalia Yakovleva, Cardiff University

Potato is the single most popular vegetable on the UK food market, which is sold in fresh and processed forms, involving local and foreign producers, small and multinational companies. Potato supply penetrates various distribution channels including green grocers, supermarkets and food catering and is highly characteristic of the current food supply chain in the UK. This paper investigates the economic and socio-environmental dimensions of the potato supply chain in the UK, exploring the characteristics of the existing conventional potato production, nature of supply chain relations, environmental impacts and social concerns related to potato production and consumption. The paper discusses the role of technological change in shaping the conventional potato supply chain and its implications for sustainability. Finally, the paper provides an analysis of development of organic production, exploring its relations with conventional potato supply and ability to address the existing sustainability concerns. The paper is based on qualitative research and interviewing of key actors in the UK food sector.

43-4 Putting Aggregate Quarrying under the Spotlight of Sustainability

Michalis F. Vaidanis and D. C. Kaliampakos, National Technical University of Athens

Sustainability is a critical issue for the mining industry. The numerous national and international projects that deal with the different aspects of mining and sustainability testify for this fact. However, little attention has been yet paid in addressing the special needs of aggregate quarrying in the context of its compatibility with society and nature. The very magnitude of the sector, both in terms of value and quantity produced, as well as the texture of its characteristics pinpoint the significance of aggregate quarrying for the developed world. The importance of aggregates as construction materials and the relevantly high transportation costs usually place quarries near or even within urban and developing areas. The vicinity with inhabited land combined with the various impacts like visual pollution, soil erosion, fauna and flora disturbances and other effects impose a distorted image of mining in general, on the public opinion. This paper is a contribution towards a thorough investigation of the different aspects and characteristics of aggregate quarrying as a means of achieving a better understanding of the sector and of seeking an enhanced relationship with society and the environment.

43-5 Sustainability Communication: Analysis of Websites of Companies Working in Bangladesh and Pakistan

Asghar Naeem Malik, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

Business sector is one of the key role players in achieving the goal of sustainable development. At the same time there are growing international demands for business firms to be more transparent and more accountable for their economic, social and environmental impacts wherever they operate (Waddock, 2004). Therefore, the communication of concern for sustainable business practices by a firm is an important indicator of its transparency and its sensitivity to sustainable development.

The revolution in IT and the development of World Wide Web provided a comparatively cheap and easily accessible medium for the business sector to communicate its sustainable business practices to all the cautious stakeholders across the globe. So, there are good reasons to assume that most of the large business firms maintain their websites and use this medium for the communication of their sustainable development practices.

This study is an attempt to examine and compare the extent of penetration of social and environmental dimensions of sustainable development practices, in the business sector of Bangladesh and Pakistan, reflected through the communication of such practices on their official websites.

44-1 Enhancing the contribution of Life Cycle Interpretation to environmental analysis and decision making

Giannis Tsoulfas, Costas Pappis and Thomas Dasaklis, University of Piraeus

Although Life Cycle Assessment has gained wide acceptance among researchers and companies, its last phase, that is, Life Cycle Interpretation, is still under development. In this paper we trace issues that Life Cycle Interpretation has to address with respect to the previous phases of Life Cycle Assessment as well as regarding the individual characteristics of product systems. We also propose some tools to support environmental analysis and decision-making in supply chains.

44-2 Analyzing and Modeling of Life Cycle Assessment Database System

Yaping Zhang and Yuhui Zuo, Environment Department, Nanjing University, China

The complexity of life cycle assessment, variety of data sources and onerousness of data transactions mean that computer software would be an effective tool which can't only deal with data accurately and quickly but also store information. Based on the Related Database Theory, a life cycle assessment database system was designed. According to different types of data used in LCA, data were categorized into four classes: product assessment data, product dossier data, basic material data and impact assessment basic data. Four databases were designed and structures and models of these databases were established.

44-3 A Study on Integrating Health Risk Assessment and Life Cycle Assessment.

Chia-Wei Chao, Hwong-Wen Ma and Ming-Lung Hung, Graduate Institute of Environmental Engineering, National Taiwan University

Life cycle assessment (LCA) is a systematic approach that evaluates environmental impacts holistically and thus avoids the unintended trading of one environmental problem for another. Traditionally, LCA does not consider spatial, temporal, threshold and dose-response information in the impact assessment. The weakness diminishes the environmental relevance of the evaluation result, especially for the human health category that deeply concerns the public. This study tries to integrate the fate and exposure models of health risk assessment (HRA) with the LCA, to increase the credibility of evaluation result of human health. Recently, three main approaches of integrating HRA and LCA have been developed: human toxicity potential (HTP), Intake Fraction (IF) regression model, and Environmental Damage Estimations for Industrial Process Chain. A comparison between those methods based on spatial/temporal consideration, fate and exposure analysis, compatibility with LCA, and the existing case studies shows that HTP is the most suitable approach. This study adapts the concept of human toxicity potential, and uses the multimedia fate and exposure model CalTOX to compute the local HTP for 349 substances. Finally, we perform a case study by using HTP to evaluate the human health impact of 9 different drink packages. The result shows there is a significant difference between the HTP method and traditional impact assessment method such as Ecoindicator'95 and '99.

45-1 Labors of Globalization: Emergent State Responses

Jonathan Bach and Scott Solomon, University of South Florida

This paper seeks to add to a growing body of empirical research on state transformation due to processes of economic globalization, in particular the assertion of state policy over areas where control at first seems to be "eroded." In order to investigate the implications for sustainable development, we examine the dual processes of global labor migration and the formation of offshore spaces. We argue that scholars have only recently begun to recognize the extent to which developing states are actively seeking to encourage and facilitate migration in order to generate external finance through remittances. We demonstrate how this process is creating a globalized national workforce that is being increasingly integrated into new national projects leading to a reconfiguration of the territorial polity. From the cultivation of remittances to dual citizenship laws, we find that states with large migrant populations are increasingly reflecting the logic that migration transforms states and states transform migration. The formation of offshore spaces such as economic processing zones further highlights the state appropriation of transnational processes as national projects, bringing into stark relief the tensions between sovereignty, transnationalism, and nationalism and showing how states are transforming themselves, but not under conditions of their own making.

45-2 Considerations about ISO 14001, and suggestions for the next revision

Tine Herreborg Jørgensen, Aalborg University, Denmark

The aim of this paper is to discuss a number of issues related to ISO 14001:2004, the international standard for environmental management systems (EMS) with the purpose of improving the next edition in order to recognize and reflect new recognitions in approaches to pollution prevention. The standard is a process standard that leaves room for interpretation at company level as well as among lead auditors from certifying bodies. A case study is presented and shows lack of life cycle thinking in product development. The paper suggests changes of ISO 14001:2004 in order to include a clear product focus. It is also suggested to formulate clearer demands for targets and environmental improvements, and to include a demand for publication of an environmental report to promote a constructive dialogue with relevant stakeholders.

45-3 SEA, Environmental Governance and Environmental Justice: A tale of two jurisdictions

Jennifer Elizabeth Dixon¹, Barbara Illsley and Tony Jackson², (1) Department of Planning, University of Auckland; (2) The Geddes Institute, School of Town and Regional Planning, University of Dundee

The parallel development of community and spatial plans creates a challenge for those engaged with the implementation of SEA. Case studies in two similarsized jurisdictions, Scotland and New Zealand, are used to explore the relationship of SEA, environmental governance and environmental justice through an examination of the relationship of community and spatial plans. While both countries provide for the preparation of community plans, only Scotland has a formal requirement for SEA. The production of these tiered plans raises some interesting questions around the relationship of spatial plans prepared under SEA methodologies with others such as community plans that address broader social and economic issues, located within particular arrangements for environmental governance. Of particular interest to this paper is whether these differently and separately constructed plans, when developed under diverse systems of environmental governance, can deliver transparent, open and environmentally just policies. The paper suggests that there may be a stronger potential for the emergence of environmentally just policies in a jurisdiction where there is a legal requirement for SEA compared with one where the mandate for SEA is weak. In the latter context, preparation of new community plans may assist in overcoming social and economic deficiencies in SEA.

45-4 Is Circular Economy A Real Solution for China? An Analysis from Regional Perspective

Jun Bi, Bing Zhang and Shi Wang, School of the Environment, Nanjing University

Circular Economy (CE) has been one of the national policies to reflect the hotly promoted "scientific development strategy" by Chinese central government. As usual, such policies are promoted all over country like a political movement, but the central government does not have a real working plan that is suitable for all the regions in China. Do we really need a universal development strategy in China? If not, what should be the differences in terms of the implementation of CE? Are CE real solutions for all the provinces?

Based on statistical data from 31 provinces and metropolitan areas in China, this paper constructs an "environmental pressure – institutional capacity – driving force for the development" model (EID) to conduct the need-response analysis for CE implementation. "Needs index (based on environmental pressures and material eco-efficiency)", "capacity index (based on institutional capacity)" and "effectiveness index (based on needs index, capacity index and the driving forces for rapid development)" are established to conduct spatial and temporal analysis for the implementation of CE in various regions. The results show that there are significant regional differences in terms of the above indexes. This will help both central and local governments formulate realistic regional policies in the implementation of CE.

46-1 Livelihoods strategies in a changing environment: Umutara case study in eastern part of Rwanda

Théphile Niyonzima, Goteborg University

The majority of Rwandan population lives in rural areas and depends primarily on farming activities for their livelihoods. The rural population density remains among the highest in Africa and has been source of pressure on land available. Contrary to other regions, Umutara province presents a particularity of having been recently subject of humanization in the aftermath of 1994 Genocide. Hence, from the last decade, land distribution, massive population settlement and subsequent rapid land exploitation have triggered off a land use dynamic leading to visible environmental changes. In parallel, the population strives to cope with new challenges in adapting their livelihood strategies to land resource changes and land scarcity resulting from excessive exploitation. The paper presents an ongoing study of different processes revolving around population-environment relationship with special regards upon land uses and their impacts. A theoretical framework and methodological approaches are discussed drawing upon "frontier", "intensification" and "political ecology" concepts. These concepts are expected to shape the analysis and discussion of human-environment interactions in the study area.

46-2 Urban Water Resources Sustainable Development: A Global Comparative Appraisal

Manouchehr Vaziri and Reza Tolouei, Department of Civil Engineering, Sharif University of Technology, Iran

The challenges of water resources sustainable development are enormous. Around the globe, the increasing use of water coupled with the environmental deterioration calls for sustainable development of the limited water resources. Globally, some 1.1 billion people lack access to safe water and 2.6 billion lack access to safe sanitation when 1.7 million premature deaths are attributable to unsafe water, poor sanitation, and poor hygiene. As a significant part of the world's population still lacks access to safe water and adequate sanitation, and as global urbanization continues to increase, continuous, comprehensive, coordinated and cooperative water resources management is required for sustainable future of urban areas. The objective of this study was to assess water resources sustainable development for selected urban areas around the world. Using centralized databases of international agencies, for the period of 1993 to 1998, urban information pertinent to water resources were collected, analyzed and modeled. The study database consisted of information regarding urban water accessibility, consumption, price, wastewater treatment, and other pertinent social, environmental and economic indicators. After preliminary evaluation of more than 350 cities around the globe, due to data inaccessibility, incompleteness and missing, 107 cities were selected for detailed analysis. The statistical analyses for the selected cities showed interesting results and relations in connection with urban water resources sustainable development in different regions and countries. For the period of 1993 to 1998, elasticity of database variables were developed. Using

elasticity's, urban ranking addressing water resources sustainability was suggested. The developed elasticity's and rankings were used in taxonomy of the selected 107 cities, and reflected considerable variations in urban water demand and supply development. As each urban area is unique in many historical, geographical, cultural, social, political, environmental and economic aspects, any comparative appraisal needs due considerations of local factors and issues. Nevertheless, the applied comparative appraisal methodology is suggested as a compliment to any other type of appraisal to enhance urban policies in support of sustainable urban water resources development. The study confirmed the significance of urban areas water resources sustainability challenges of the 21st century.

46-3 Basic Urban Service Delivery for the Slum Poor in Bangladesh Cities: Potentials and Limitations of Partnerships

Mallik Akram Hossain, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

Chronic shortages of basic services for the urban poor and their consequent environmental and health impacts are common phenomena in developing countries such as Bangladesh. Policy makers are trying to find new ways as conventional approaches to service delivery are often not well fitted particularly to informal settlements. Partnership approach introduced in the western world is being practiced in many third world countries to improve the provision of urban services. Urban governance, a process through which partnership works, has a greater impact on urban service delivery. The prime objective of this paper is to explore the possibilities and constraints of sustainable solutions to basic urban service delivery (Sanitation) for the slum poor. An exploration is made if partnerships work in the socio-political context in Bangladesh through the discussion of empirical findings based on field surveys carried out in two cities of Bangladesh. The potentials and limitations in fostering partnerships in sanitation service in Bangladesh cities have also been identified.

47-1 The Roles of Countrywomen in Controlling Non-point Source Pollution

Dongmei Jiang, Yuanfang Zhou and Genfa Lu, Environment School of Nanjing University

The main causes of non-point source pollution in Tai Lake are the improper ways of crop production, animal husbandry, and daily runoff. It discusses the relationship between countrywomen and non-point source pollution control by 731 questionnaires in Weidu village and 466 questionnaires in Dapu Town. The roles of countrywomen have changed in families and they have close relationship with non-point source pollution. Furthermore, we discuss the possibility and methods of organizing countrywomen in non-point source pollution control.

47-2 Global Governance and Gender: Gender Mainstreaming, Sustainable Development and the UN

Morrow Karen, School of Law, University of Leeds

Increasing recognition of the key role of women as actors in progressing sustainable development now makes it incumbent for the debate on international governance to engage with it. Two key themes must be addressed: the need for effective engagement with gender issues and questions gender and sustainable development.

This paper will consider the interaction between the women's and environmental agendas in the UN. The prominent position allotted to these issues in the UN's crosscutting agendas in gender mainstreaming and sustainable development creates an interesting opportunity to evaluate, whether, and, if so, to what extent, they are mutually supportive. Dealing creatively with the issues that intersect environmental and women's concerns has the potential to achieve rewarding synergies. However, given the immense scale, intricacy and sensitivity of the issues involved, there is no guarantee that issues of common concern between them will necessarily be tackled harmoniously.

The issues raised by the synthesis of gender and sustainable development issues ultimately raise profound issues concerning the very nature of governance and arguably have a great deal to offer in working out new paradigms for participatory democracy and equal citizenship.

47-3 Sustainable Mobility: An Implicit Function of 'Equity'

Tanu Priya Uteng, Norwegian University of Science and Technology, NTNU

Sustainable Mobility emphasizes the need to integrate mobility into an overall pattern of sustainable-development. Various discussions on this theme inevitably point towards altering the patterns of mobility by focussing solely on the goal of environmental protection. Mobility however is a contextualized phenomenon operating beyond mere 'movement', being widely linked to the ideas of *liberty*, *equity*, *risk* and *need*: which necessitate a more generic understanding to pursue the goals of sustainable mobility in a practical and achievable fashion. This paper attempts to further the agenda of policy studies through reviewing the mobility patterns and needs of non-western immigrants in Norway; carried out through a random sample of 125 immigrants. The study sheds light on the 'equity' aspect of sustainable mobility ethos using both quantitative and qualitative analysis in the realm of transport planning. Through highlighting the mobility needs of the immigrant group, it establishes a case for fair distribution of mobility resources among the non-western immigrant community in Norway to achieve one of the primary goals of sustainable development, namely equity and social justice.

48-1 The case of regional inequalities in the State of Santa Catarina/Brazil: an analysis of the different areas of employment

Marcos Ferasso, Unoesc

Empirical affirmations that Santa Catarina/Brazil has developed in different ways in its regions have led the authors to investigate if exist and what differences exist that delay the economic development of Santa Catarina. This case study delineates the economic basis and the regional differences through descriptive analysis of diagnosis. The salient results determine that Santa Catarina was colonized in a way that was planned up to a certain point, propitiating the installation of the Exporting Basis and later the Economic Basis of each of the five macroregions. Identifying the occupation area, population, fundiary structure, and the employment degree, its "power" of endogenous development and its regional differences where the heterogeneity of these macroregions occurs. With the presence of these regional differences, these specificities give foundation to the economy strength in relation to other states of Brazil. There is an imbalance in the investment of resources. To balance these, Catarinian public policies it's necessary to consider a development project to the West that favours the generation of a more balanced regional development in the State. There's a great disparity among the studied regions, but that this is not the responsible for the difficulties of leveraging up the economic development.

48-2 The Integration of the Sustainability in the Urban and Territorial Planning. A Look through the European and Basque Approach

Oscar Santa Coloma, Arantzazu Urzelai, Itziar Aspuru and Gemma Garcia, LABEIN – Tecnalia

Sustainability principles have been recently incorporated to the urban and land use planning and management. Actually in terms of understanding, there is still a need for a European consensus on the concept of sustainable land use planning and management.

This paper presents a look for the European approach, when it is shown that this process of convergence – although in an early stage – can be observed on theoretical level and with regard to planning tools, but that organisational models for integrating these two disciplines of planning only exist in the most advanced member states of the European Union and in very diverse forms.

An analysis of present tendencies and challenges related to strategic environmental management and spatial planning indicates that the recent European Directive on the Strategic Environmental Assessment of Plans and Programmes, where some effects can occur in the territory, is likely to push ahead the development of tools for strategic environmental management, linking to advances in basic research, which improve our understanding of the environment, and to increased data availability provided by advanced technologies, which help to identify given and anticipated impacts on the natural and the built environment.

48-3 Synergy for Sustainability A framework for rural-urban synergy for sustainable rural development

Momen Md Saiful, Department of Urban and Regional Planning, University of Hawaii at Manoa

After more than a decade of macroeconomic policies that had no explicit role for rural space in development, Rural Development (RD) experienced a rebirth in the late nineties. This reinvention of RD stands to gain from the experiences and insights that were accumulated during the late eighties and early 1990s. A review of such new insights is provided together with their policy implications. This paper argues that rural development and town development have important synergies to take advantage of, the neglect of which undermined the sustainability of programs around the world. A conceptual framework is laid out for synergistic rural urban development. The major thrust of the framework is that local economic growth and retention of multiplier in the economy are necessary, though not singularly sufficient, conditions for sustainability of RD. The interplay between these and other conditions are identified and a brief agenda for research and action is proposed

49-1 Malaysian Urban Indicators Network (MURNInet) : From Pilot Project to 13 Cities Implementation

Kamalruddin Bin Shamsudin, Federal Town and Country Planning Department Malaysia

The Malaysian Urban Indicator Network (MURNInet) is Malaysia response to measuring sustainable development at the City and Town level. Since its initial conceptualization in 1997, it has undergone gradual improvement, beginning with lessons learned from its pilot projects (2002-2003; six cities and towns of various levels), and those of 2004 (for eight capital cities). This paper discusses such development and its implementation framework adopted. Further MURNInet has been subjected to various stakeholder feedbacks which suggest amending and improving the various indicator benchmarks and sustainability classification within a output-based indicator model. Comparison with other indicator programmes in the country and those of Millennium Development Goals (MDG) of UN-HABITAT are provided to suggest focus area of MURNInet and its strength over such indicator programmes at the City and town level.

49-2 Research on quantitative assessment of economic sustainable development of Jiangsu province

Bangcheng Cai, Genfa Lu, Dongmei Jiang, Shangfu Han and Lijuan Song, School of Environment, Nanjing University

In conjunction with environment performance and society benefits, a definition of economic sustainable development was proposed, and Polygon Synthesis Indicator method was introduced to quantitatively evaluate economic development sustainability of Jiangsu province from 1990 to 2003 based on economic development,

resource and energy consumption, environment and ecology pressure, and social benefits. The results showed that comprehension, index of economic sustainable development of Jiangsu province increased gradually from 0.123 in 1990 to 0.521 in 2003, and economic development of Jiangsu province improved continuously from the state of weak sustainability to that of relatively weak sustainability, then to that of relatively strong sustainability during the past 13 years; The coordination index of economic sustainable development increased in the earlier 1990s, however decreased since 1996. Effective measures need to be taken to increase coordination of economic sustainable development. The relationship between economic sustainable development comprehension index and four affiliated indexes(EDI, RCI, EPI, and SBI) can be described by linearly equation: $D = 0.152EDI + 0.308RCI + 0.453EPI + 0.502SBI - 0.458$. In the later, more attention should be given on social benefits, especially on social equity when making policy for sustainable economic development of Jiangsu province.

49-3 Sustainability Impact Assessment in Hong Kong and the Pearl River Delta is "Both Necessary and Impossible"?

Mee Kam Ng, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

This paper outlines a sustainability impact assessment (SIA) framework through the integration of the still evolving dynamic practices of sustainability appraisal and impact assessment. Given the rapid economic integration of Hong Kong and the Pearl River Delta since China's open policy and the consequent social and environmental degradation, assessment of sustainability impacts of future development projects is quintessential. However, if we use the synthesised framework to review how projects have been carried out in the Hong Kong and the Pearl River Delta region, some fundamental problems for local authorities to carry out SIA before embarking on development projects can be identified: minimal integration between the two systems in terms of institutional set up and strategies and policies concerning sustainable development; pre-set sustainability indicators rather than tailor-made ones to assess policies, programmes and projects of various nature; and rather different social, economic and environmental norms and development problems. In the short run, given these constraints, SIA in the region is "necessary" but rather "impossible". Nevertheless, recommendations are put forward to facilitate the regional integration of SIA practices in the longer term.

49-4 Community Sustainable Development Indicators: Case Study of Mingshan Neighborhood, Taipei, Taiwan

Shih-Chien Lin, Yung-Jaan Lee, Po-To Chen and Jia-Gung Yeh, Graduate Institute of Architecture and Urban Planning, Chinese Culture University

Taipei has issued the "Taipei Agenda 21" (TA 21). However, the focus of TA 21 is more on the city level than on the community level. Therefore, it is necessary and urgent to address sustainability issues in community levels. This study examines sustainable development concepts of residents living in Mingshan Community, Taipei and to explore what the appropriate set of sustainable community indicators is for communities in Taipei. From literature review and questionnaire analyses, this study first establishes a set of sustainable community indicators, which includes environmental, social, economic, and institutional dimensions and 10 indicator clusters with 38 indicators. Focus group discussions are adopted to evaluate these indicators. After establishing the sustainable community indicators, 158 individuals' attitudes toward these indicators are investigated. Over 71% of the respondents indicate that ecological indicators are appropriate for their community. For the social indicators, 66% of the respondents agree with these indicators. With regard to economic indicators, 58% agree yet 30% disagree. For the institutional indicators, 71% respondents think these indicators are appropriate. Furthermore, 10 key indicators are selected by the respondents. Among these 10 key indicators, six are ecological dimension; three are social dimension, with one from the institutional dimension.

50-1 Self-reported environmental awareness and Willingness to pay for environmental protection: A survey in Hong Kong

Wai Kee Yuan, Hong Kong Shue Yan College

Enhancing the environmental awareness of the general public is always a primary approach of promoting environmental protection. However, increases in environmental awareness do not necessarily mean that the general public is willing to pay more for environmental protection. In this paper we focus on investigating the correlation between self-reported environmental awareness and willingness to pay (WTP) for environmental protection. Using data from a survey conducted in April 2005 with 600 randomly selected citizens in Hong Kong; we find that 1) self-reported environmental awareness is positively correlated with individual's WTP for environmental protection. 2) Individual's view of the environmental awareness of other people in Hong Kong does not correlate with individual's WTP for environmental protection. 3) If a person thinks that he/she is more aware of environmental protection than other people in Hong Kong, they are willing to pay more for environmental protection. 4) The correlation between WTP for environmental protection and environmental awareness varies among gender, household income, educational background and age groups.

50-2 Environment and Safety Management Systems: A Case Study at ENEA Research Centre

Donato Viggiano, Italian National Agency for New Technologies, Energy and the Environment (ENEA)

Scientific research plays an important role on both the technological progress and growth of competitiveness of the economic system and, hence, on the increase of the comfort of the society. To maintain their scientific and technical superiority, universities as well as research centres have an uphill task to focus their research efforts

targeted especially to the territorial needs and, subsequently, made available the high level technological and scientific innovations to the real users.

ENEA, the Italian National Agency for New technology, Energy and the Environment, is a scientific research and technology development organisation that bases its operations on the development and application of innovative, leading-edge technologies. It also provide scientific and technological consulting and support to national and local governmental bodies in the solution of complex, urgent and serious problems, the preparation of regulations, etc. ENEA Research Centre Trisaia is the first of its kind, in Italy, who in accordance with ISO norms (14001) and OHSAS norms (18001) could succeed to have double certifications both for Environment and Safety. Innovative management system operating in the integrated mode control all the environmental and safety concerns relevant to the activities being conducted by the centre.

Integrated management system is the result of two years hard working in the framework of a project entitled, "SIAMESI" (Integrated System of Environment and Safety), undertaken by ENEA research centre Trisaia during the year 2003. The main objective was to optimise the quality of environment and the safety (both inside the campus and the surrounding territory) related directly/indirectly to all the research activities (experimental) and other services conducted at the centre. Salient features of the SIAMESI model, are given below;

- Reduction of the consumption of natural resources
- Control polluting resources
- Correct and rational management of wastes
- Improved operational efficiency in the safety management
- Maintenance of the legislative conformity
- Potentially low level verifications and inspections of the control authority
- Efficient managerial capacity
- Reduction of the environmental and safety costs
- To improve public opinion and credibility of the organization
- Better contacts with the parties interested
- Better environmental communication
- Diffusion and transfer of the experience gained

It is our planning to recommend the Integrated Management Model developed by our centre to be adopted as a "Pilot-Model", to be used by industries as well as Metropolitan areas.

50-3 Environmental Risks Analysis and Management of Yangtze River Basin (Jiangsu)

Jie Yang^{1,2}, Jun Bi¹, Jingbo Zhou¹, Haiyan Zhang¹ Qiliang Li¹ and Lei Shi¹, (1) State Key Laboratory of Pollution Control & Resource Reuse, School of the Environment, Nanjing University; (2) University of Science and Technology of Suzhou

Regional industrial development has been one of the driving forces for the development in China and it has been enhanced by the trend of globalization. For example, along Yangtze River in Jiangsu Province, more than 20 development zones have been established, among them many are high-risk chemical industrial parks. Environmental risks associated these industrial parks have come to be the major obstacles for regional sustainable development. More and more environmental risk accidents have occurred in China in the past five years, causing significant economic, environmental and social losses. However, there have not been unified concepts and theories in China for the analysis and management of regional environmental risks. In this paper, the concept of environmental risk system is put forward and the framework of regional environmental risk management is constructed, which includes both environmental risk preventive warning system and emergency warning system. An environmental risk information archive system is established to support the above systems. Finally, Yangtze River Basin in Jiangsu Province is taken as a case study to apply this regional risk management system.

51-1 Social Dimension of Industrial Ecology: On the Implications of the Inherent Nature of Social Phenomena

Walter J.V. Vermeulen, Copernicus Institute for Sustainable Development and Innovation, Utrecht University

Since the 1990's a substantial body of scientific literature has grown on the necessity, opportunities and attractiveness of industrial ecology strategies. The metaphor of closed wood webs in eco-systems challenged many scholars into designing strategies for industrial transformation, promoting closing of material cycles, inter-firm cooperation in Eco-Industrial Parks and redesign of production processes and products. In many cases proponents claim combined ecological and economic gains. Yet, mainstreaming of industrial ecology practices proofs to be a road with slow progress. This paper analyses the (often implicit) assumptions on society's responses to strategies promoting industrial ecology. Originating from natural sciences, theorists of industrial ecology often use a simplified model of actor's behaviour in society, stressing a 'single actor rational choice' approach. Innovations proposed in industrial ecology generally imply social processes going far beyond this 'single actor rational choice' model. They involve processes of multi-actor cooperation, divergence in actor group characteristics and dynamics and interactions between various domains of society (state, science, production, civil society and people). In this paper the central position is that proper understanding of these social phenomena is essential in understanding the (slow) progress in mainstreaming industrial ecology. It will be demonstrated with cases in the field of Eco-Industrial Park development, sustainable building and eco-design. This analysis of the social dimension of industrial ecology calls for an additional research agenda.

51-2 Of Butterflies and Hummingbirds: Industrial Ecology 'On the Wing'

Van Miller, Human & Ecological Research

As a boy, I once went goose hunting with my older cousin. He explained one thing to me that day as we climbed up the hill that looked down on the goose pond. That one thing was the important rule—the geese must be shot 'on the wing.' To shoot them while they floated on the water would be not only unsportsmanlike but also wrong. I have forgotten whether we bagged any geese that day (probably not), yet I have never forgotten those words—'on the wing' and the admonishment to shoot according to the rules. But let's dispense with the hunting metaphor and shooting (leave that to the bushmen), and instead, let's discuss butterflies and hummingbirds 'on the wing.' You ask—what does that have to do with industrial ecology (IE)? My reply is—Much—for an emerging discipline that draws its inspiration from natural systems.

In a paper presented at last year's Sustainable Development Research Conference, Randles (2005) discussed theoretically the issue of scale or geographical levels for industrial ecology. Her point was (page 6): We can no longer envisage a simple hierarchy of separate levels—the individual, the household, the neighborhood, the urban, the national, the global, or alternatively, the plant, the firm, the sector, the economy, because such a hierarchical interpretation requires the conceptual privileging of one scale over another when, in fact, the interaction between these levels demands that they be seen as overlapping and 'superimposed.' From her discussion about geography and TNCs (transnational corporations), the necessity of viewing the relevant eco-system as an intertwined mixture of spatial levels and organized actors must be given more attention if IE is to provide a useful perspective for understanding and then improving ecosystems worldwide.

When I couple her concern for geographical levels with my interest in institutional exchanges that interrupt IE flows, as exemplified by butterflies and hummingbirds, the subject that comes into view is the Americas—North and Central as a single continuous unit. Each year, the monarch butterfly (*danaus plexippus*) spends its summer in the United States/Canada and its winter in Mexico.

This annual migration represents a migratory flow for a single butterfly of several thousand miles and for the species an annual one of millions of miles.

The hummingbirds present a similar though divergent picture. The rufous hummingbirds (*selasphorus rufus*), summer up north and winter down south in Mexico like the monarchs. However, there is a geographical exception among the hummingbirds. Some of them, like the ruby-throated hummingbirds (*archilochus colubris*), fly even farther south and winter in warmer Central America.

For most human observers, the amazing feat performed by these species is how incredibly long they are 'on the wing' during their annual migrations. For me, these aeronautical feats are also impressive, but more importantly are the exchanges promised at each end of the long trips. Each species knows that both in the south and the north, it will be rewarded with the sustenance of life for having endured the trip. For butterflies and hummingbirds, being 'on the wing' within an international ecosystem enables them to sustain their lives by undertaking local exchanges according to natural rules in each locale.

For the homo sapiens that occupy the same geographical space as the butterflies and hummingbirds, there is an analogue here, and it can be found in regional trade agreements, i.e. NAFTA and CAFTA.** NAFTA, ratified in 1993, and CAFTA, ratified in 2005, have created two international ecological niches (our thinking here is in line with the population ecology school of organization theory) for business organizations in North America. These new niches, as Randles contends, cannot be viewed as local ecosystems. True, they draw from and alter such a system, but they are also internationalized regional systems that homo sapiens have created and developed and now maintain. The maintenance of these contrived ecosystems results from the rules found within the regional trade agreements and the organizations that created and shaped those rules.

In two presentations last year (Sustainable Development Research Conference, Helsinki; Carnegie Bosch Institute International Conference, Stuttgart), I discussed in considerable detail and explained with multiple examples how the flows of IE are always subject to economic exchanges—the intellectual grist of institutional theory. Trade agreements are essentially nothing more than the institutionalized formal rules for how the flows of international commerce will be exchanged at the national borders. Local exchanges give life to the international trade agreement, sustain it, and simultaneously impact the domestic ecosystem. Therefore, the way in which a trade agreement is developed and implemented becomes a matter of crucial understanding for those of us seeking to apply the descriptive-normative logic of IE to the sustainable development paradigm.

To further this understanding, I intend to discuss and analyze both NAFTA and CAFTA from the perspective of business firms and sustainable development. Both trade agreements contain specific sets of rules for how labor and environmental issues (the operational constructs herein for sustainable development) are to be handled vis-à-vis trade in goods and services and foreign investments. However, each agreement handles these issues very differently. In fact, NAFTA is generally viewed as a toothless tiger; whereas, CAFTA actually contains penalty clauses for substantiated violations of its sustainability rules. In light of these rules, the distinct ecological niches created by the agreements become readily apparent and permit me to speculate how different firms and industries may react to these enacted environments. Will business organizations, like the hummingbirds, migrate to Mexico or Central America in their pursuit of a 'warm' niche for certain business activities? And as they operate 'on the wing,' will their actions do more good than harm to the sustainability of the region?

In outline format, the paper will be organized as follows:

- Introduction discussing the theoretical ideas underpinning the subsequent discussions

- Explanations of the migratory flows for butterflies and hummingbirds
- Review of NAFTA and its pertinent rules
- Review of CAFTA and its pertinent rules
- Concluding discussion of how firms and industries may react to the niches enacted by these trade agreements and impact sustainable development in the region.

51-3 Industrial Ecosystems: An Evolutionary Classification Scheme

James Scott Baldwin, University of Sheffield

As the world is rapidly transforming, economically, socially and environmentally, industrial eco-systems (networks of industries) are urgently needed that impact these three domains positively. But what does a sustainable industrial ecosystem look like? What are the features? Are there different types? What about the future? According to the literature there are many types, both existing and desired, along with unique features and characteristics. However, the typologies proposed are many, with several authors overlapping concepts and theories. Employing manufacturing cladistics, based on biological classification science, an overarching, conceptual classification system has been developed of existing industrial ecosystems from case studies documented in the literature. Building on this and with the aim of modelling industrial ecosystem evolution, this paper presents a methodology that integrates manufacturing cladistics with evolutionary systems modelling, from the physical sciences. The utility of the modelling would be to guide transformations through scenario investigations where a) evolutionary differences between sustainable and non-sustainable industrial ecosystem structures are explored, and b), new structures are identified offering industries novel solutions for sustainability. If successful, this approach may lead to the development a blueprint and decision-support system that industrial ecologists, planners, decision- and policy-makers can effectively utilise for sustainable industrial development.

52-1 The use of 'wastes' as resources: treating contaminated water

Karen Lousie Johnson¹, Selina Bamforth², David Manning² and Ian Singleton², (1) University of Durham; (2) University of Newcastle upon Tyne

In the treatment of waste waters and the sustainability of this idea is outlined. The use of these 'wastes' not only prevents their disposal to landfill and reduces primary aggregate extraction but also moves our economy towards an industrial ecological model where materials move in cycles.

The secondary/recycled aggregates used include concrete and Basic Oxygen Slag (BOS). Both their highly alkaline nature (pH10 and above) and relatively high surface areas make them attractive materials for waste water treatment. Three novel uses for secondary aggregates are introduced and the results from pilot scale systems are discussed:

- A SCOOFI (Surface Catalysis by Oxidation Of Ferrous Iron) system using BOS for iron removal
- A SCOOM (Surface Catalysis by Oxidation Of Manganese) system using BOS and concrete for manganese removal
- A phosphate removal system using BOS

Removal rates for all of these systems have been high with residence times ranging from 2 minutes to 4 hours. High pH effluents are not a long-term feature of these systems as the substrate accretes with iron/manganese oxyhydroxides or calcium phosphate. This 'armouring' reduces the alkalinity-generating potential of the substrates. Since these sorption/precipitation processes are largely autocatalytic, water treatment continues as long as there is sufficient hydraulic permeability within the system. The spent substrates from all of these systems have the potential to be used as soil conditioners/soil remediation products. This 'upcycling' not only reduces the requirement for landfill but completes the cyclic loop which makes these systems truly cyclic and sustainable.

52-2 Is Water Pollution Risk More Acceptable in China?

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Cost-of-remediation (COR) has been used as a proxy indicator of environmental stress. A ratio between COR and GDP can be considered as a proxy indicator of environmental pollution risk. This paper estimates the CORs and water pollution risks (WPR) of all the provinces in 1993 and 2003, respectively. The results are: 1) the WPRs for all the regions dropped significantly, which may due to the rapid development of economy and the alleviated waste water pollution during the ten years; there is a reversed "U" curve, indicating the relationship between WPRs and GDP per capita 2) the drop of overall WPRs from 4.1×10^{-4} in 1993 to 9.3×10^{-5} in 2003 is due to the rapid economic development. The overall COR is still very high. A lower WPR in 2003 also means that China has higher financial capacity to control water pollution. 3) there is a reversed "U"curve, indicating changing trend of COR of China during the ten years, which just confirms to the Environmental Kuznets Curve, it shows that according to the recent trend of economical development, the COR will still decline gently. 4) There is no significant evidence to show that change of GPP per capita in amount or in rate is associated with the decreasing rate of WPRs. 5) the sustainable statuses in various provinces in China in 1993 and 2003 are classified to provide a rough understanding of the status of each provinces to the policymaker.5) if pollution risks from other environmental stresses such as air pollution and hazardous wastes have been included, China is now facing serious environmental pressures.

52-3 An Initial Study on Water Purification with Grass Cultivation in Net Cage

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Recovery of submerged plant is a difficult problem of aquatic ecological restoration. One of the causes is the low penetration of light in the polluted water. *Ceratophyllum demersum* L. is rootless, living apart from bottom soil and suspending readily in water. The depth in water can be adjusted to meet the light demand of submerged plant. During the period of 1999-2005, the extended experiments in different areas with different conditions have been conducted. The following points are the results. 1. This method had great effects on increasing oxygen and decreasing nitrogen and phosphorus. The reduction of NO₃, NO₂ and NH₃ has been preliminarily demonstrated. 2. *Ceratophyllum demersum* L. grown in the net with different methods can survive from three months to three years. 3. This method to purify polluted water has a bright future and has a wide application in aquatic ecological restoration. 4. This method can be transformed into a practical technology. 5. Artificial wetland has been in its initial step.

53-1 Sustainable Transdisciplinary Integrated Planning for Post-Tsunami Reconstruction Activities in Sri Lanka

Arnim Wiek and Katja Brundiers, Swiss Federal Institute of Technology Zurich (ETH)

Since the Tsunami had devastated many of the coastal regions of Sri Lanka in December 2004, a variety of large reconstruction programs have been initiated and developed with major achievements so far. Inducing a successive transition from the first recovery phase to the second development phase, the authorities in charge have decided to conduct the ongoing reconstruction according to the concept of sustainable development. That means, the development of the affected regions is closely related to the needs of the targeted communities, economically self sustaining, environmentally sound, and long-term oriented.

This paper presents an approach for Sustainable Transdisciplinary Integrated Planning (S-TIP). The approach supports reconstruction planning and decision-making from an integrative perspective linking different socio-physical scales (e.g. household/houses and community/village), and embedding housing with other key aspects, such as livelihood supporting infrastructure (physical capital), and skills and capacity of the community (human capital). Thereby, S-TIP aims at a long-term balance of social, economic and environmental developments (sustainable development) and relies on mutual learning between experts and stakeholders (transdisciplinarity).

53-2 Urban Agglomeration, Planning and Sustainability in China

Roger C. K. Chan, The Centre of Urban Planning and Environmental Management, The University of Hong Kong

China has undertaken a rapid process of development from a planned economy to market economy through decentralization, marketization and globalization and has actively formulating her Agenda 21, both at the national and municipal levels. Several key trends have been identified with the rise of urban agglomeration and sustainability. First, the rise of mega-cities with China's increasing participation in the global economy. Second, autonomy of urban and local governments has been increased, resulting in competition at the urban and regional level. Third, spatial and social polarization has been accelerated in the wake of urban expansion and inter-regional competition. This paper aims to review current policy formulation and implementation in the realm of urban planning and sustainable development. The policy response includes a resource-constrained national economy from a sustainability perspective, the enhancement of national human resources, and the formulation of a comprehensive urban and regional development strategy.

53-3 Sustainable Concepts in Technology and Ecology in a Chinese Village

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Chinese traditional villages have similar concepts relating to sustainability on site choosing, building construction and nature resource use, etc. How to deal with this valuable ideas and methodology in a scientific way will be meaningful for sustainable village upgrading in the high speed urbanization process in China today.

Xia Futou, a small village in Boai county, Hennan province, is an ideal village pattern for Fengshui which has a series of mountain surround it with a regional river, Dan river, winds its way over the village. Based on the modern sustainability concepts, this article analyzed the valuable sustainable oriented thoughts of site choosing, local construction technology and landscape maintenance in Xia Futou, such as the use of the local materials and passive solar energy etc. Moreover, through the analyze of the social economic and culture background of its evolution, this article put forward to new approach toward to Chinese diverse vernacular housing sustainable upgrading process with the coordination of the development of ecology, economy, social culture and built environment in a village.

54-1 From Cruel Coketown to Humanitarian Letchworth: Were the Victorians Sustainable Developers?

Ian Morley, Ming Chuan University

Dickens' Coketown despite being a fictional generic townscape nonetheless emphasised the appalling condition of the environment and human living created under industrialisation and rapid urbanisation in early-1800s Britain. With administrative practices rendered useless by the scale of post-industrial problems, the British came to understand that while urbanisation was a cause of working class burdens like poverty, disease and slum housing, it could through the application of integrated policies also be a partial cure to such matters. Implementing thus a new regulatory system with environmentally-centred procedures and social and economic guidelines the Victorians radically transformed British community development to such a degree that by about 1900, via the Garden City, British urbanism had adopted a spirit akin with sustainability through creating adaptive environments that reached out to all, and encouraging human settlement in accord with nature. Given this situation this paper analyses how the Victorians dealt with the growth and management of existing settlements, producing an enduring model culminating in an invention to create a new urban order and egalitarian society, and demonstrating how notions of sustainable development which so much represent contemporary policies concerning urban development also were entrenched into British thinking more than 100 years ago.

54-2 Environmental Policy for Sustainable Cities: The Swedish Environmental Quality Objective "A Good Built Environment"

Karin Helen Edvardsson, Department of Philosophy and the History of Technology, Royal Institute of Technology, Stockholm

In Sweden the Government's aim to create sustainable cities is partly operationalized through the environmental quality objective A Good Built Environment. The objective embraces ten interim targets regarding spatial and community planning, the reduction of traffic noise, energy use, the extraction of gravel, the indoor environment, and waste disposal, and is designed to guide central, regional, and sectoral authorities' planning towards urban sustainability. In order for the objective to form a solid basis for environmental decision-making two types of rationality (functionality) conditions must be met. First, the objective should guide and motivate those who are responsible for its implementation. This applies when the objective satisfies a number of rationality criteria for single goals, e.g. precision, evaluability, attainability, and motivity. Second, the objective should constitute a rational operationalization of the concept of urban sustainability. This condition is essentially met when the interim targets to the objective enjoy a certain degree of coherence. An application of the suggested rationality criteria to the Swedish environmental objective A Good Built Environment illustrates some of the difficulties that attach to the Swedish system of environmental objectives and ultimately to the idea of using goals in environmental policy-making and planning.

54-3 Dutch Environmental Outlook: Many gains possible with technology and international co-operation

Annemarie van Wezel and Hans Nijland, Netherlands Environmental Assessment Agency

Which environmental problems seek our future attention? What additional policy is possible? What are the costs and gains? Those are central questions that the Dutch Environmental Outlook answers, based on two scenarios for economic and demographic growth until 2020 and 2040. In a scenario with strong government and much international environmental policy, ongoing economic growth is possible with lower environmental pressure. With a stronger market and economic growth, the emission of pollutants grows; a re-coupling of economy and environmental pressure. Per gained Euro, in both scenarios the Netherlands emits less pollutants. Existing environmental quality goals for 2010 will be met later, with strong international environmental policy. After 2010 more or stricter European environmental goals are possible. Member states get more freedom to reach those goals according to their own views. Indicative goals for 2020 for climate and air pollution are within reach, with international co-operation and additional Dutch policy. There are lots of technological possibilities to reduce emissions, against relatively low costs. Environmental problems on mondial scale (climate, biodiversity) or low scale (local living condition) are persistent.

55-1 Design and Construction of Sustainable Tourist Projects in Egypt: A New Framework for the Project Delivery Process

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Coastal resort projects have short and long-term impact on the environment. While the short-term impact is related to the construction phase of these projects, the long-term impact extends throughout their life cycle. Misuse of the micro and macro-environment of some coastal areas has lead to a deterioration of their natural resources, which are the very base of tourism development in these areas. Decisions made by architects and planners can result in lasting effects on the sensitive environmental features of these areas. From conception to commissioning, they have a role in mitigating the negative impact of their projects on the environment. This paper reports on a research work that ameliorates the conventional project delivery process, resulting in a sustainable approach. It proposes a new framework bridging the gap between common design and construction practices and environmental considerations/requirements, by providing an integrated process.

The proposed framework is based on a cyclic interactive flow chart having three interrelated streams. The main stream represents the main project delivery stages adopted in most projects. The other streams identify required supporting activities, whether environmental or design-related. The framework integrates these into a unified cohesive project delivery process. It is based on a "cradle to cradle" approach, i.e. from inception to demolition.

55-2 Integrating Responsive Building Elements In Buildings

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There is a global need for a more sustainable building development. About 50% of energy is used in buildings indicating that buildings provide a considerable potential for operational energy savings. Studies were conducted with the following objectives:

- to perform a state-of-the-art review of responsive building elements, of integrated building concepts and of environmental performance assessment methods
- to improve and optimize responsive building elements
- to develop and optimize new building concepts with integration of responsive building elements, HVAC-systems as well as natural and renewable energy strategies
- to develop guidelines and procedures for estimation of environmental performance of responsive building elements and integrated building concepts

This paper introduces the ideas of this collaborative work and discusses its usefulness for Hong Kong and China. Special focus was put on the description of the climate in China and a review of barriers to implement building elements and of integrated building concepts.

55-3 Exploring life in innovative high density housing in the UK

Joanne Bretherton, Centre for Housing Policy, University of York, UK

High-density, affordable housing is often advocated as one important response to current UK public policy concerns with housing shortages, containing suburban sprawl, and the desire to promote an 'urban renaissance' in older cities. However, high-density housing must overcome cultural resistance and a negative historical legacy in the UK. Residents' views on housing design, neighbour disputes and anti-social behaviour in new affordable higher density housing and the impact of the local environment on their feelings about their homes are not well understood. Neither the variations in the use made of new high density homes by different household types, nor any differences in the views of different types of household within higher density homes have been properly explored to date. Robust evidence on these issues is crucial in maximising the attractiveness of innovative forms of high density housing.

A research team from the Centre for Housing Policy, University of York has been commissioned by the Joseph Rowntree Foundation to investigate the motivations, experiences and aspirations of residents within eight exemplar innovative affordable high density housing developments across the UK. This paper will outline the aims, methods and expected outputs of this study, which is currently at an early stage of development.

55-4 Urban Sustainable Development Research on Permanent Earthquake Housing: A Developing Country Example Adapazari

Sule Karaaslan and Ozge Yalciner Ercoskun, Department of Urban and Regional Planning, Gazi University, Ankara

Turkey is situated in a geographic location where natural disasters often happen and affect on human life and built environment. Turkey is an earthquake-prone country. An alteration has been started on legal reorganization and radical decisions has been made after Great Marmara Earthquake happened on 17th August 1999 in İstanbul metropolitan area. In this alteration process, many homeless victims of earthquake began to live in newly constructed housing sites in safer areas in the periphery of the cities. Then, residents living in these new permanent sites could not integrate with the current main city. However, the first point is to improve the quality of life and satisfaction of sustainable community in globalising world.

This paper determines the integration between three new permanent settlement sites in Adapazari located in the catchment area of Lake Sapanca and İstanbul metropolitan area which were urgently selected after earthquake and Adapazari city center. The problems of planning and urbanisation after the earthquake, the post-earthquake implementation in Turkey and new settlement projects will be shortly described in physical, social and economical dimensions, then a case study on permanent housing in Adapazari is presented with questionnaires, analyses, tables and graphs in line with integration of main city center. This paper evaluates the strategies and policies about site selection of permanent earthquake housing which should be sustainable as a solution of the problems emerged in these sites.

56-1 "Ecological Planning" Concept for Urban Design at East Coast Area, Haikou City, China

Xinliang Liu, University of Dortmund, Germany

"Ecological planning" concept for urban designing at eastern coast is neither traditional urban planning, nor a pure planning for ecologic protection. It is a "controlling" planning aiming to achieve optimization of urban ecology and environmental protection and especially for the development of ecological land-use in the process of urban development. In the planning, not only total amount, spatial form and pattern of ecological land-use within urban area as well as ecological status of different area in the process of urban development are to be defined respectively, but also detailed and specific regulations have been made based on ecological importance of specific land piece on such elements as its ecological features, controlling elements, construction and mode and points for development and adjustable range of land-use property, in which, operability of the "ecological planning" has been

given special importance. It makes sustainable sense for the selected area development, such as East Coast area in Haikou City, China.

The selected case study area is East Coast area in Haikou City, China, it is planning area for the "new" tourism development, which covers 9,460 ha.

56-2 Urban-I-graph ® a graphical assistant for the sustainability of "large scale" projects for low-income groups in Maracaibo, Venezuela

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The municipality of Maracaibo has to attend the quantitative housing deficits considering the demand of 14% of its population, mainly of low-income or poor. Among their strategies are large-scale projects called "macrourbanisms", similar in dimensions to those of the modern movement but different in its management process from designing to construction and its relation to the local urban plan, which is a concept taken from the Bogotá, Colombia model of expansion. The dimensions as well as the number of people involved, require efficient mechanism to be fast and accurate, for the different phases of the process. Urban-I-graph ® is the product of research concerning the efficiency of the urban layout, in Maracaibo, and is a nomograph that induces fast and objective decisions on the elements of the urban morphology, number of grouping units, number of houses per grouping unit, family and general investments. The instrument has been tested and evaluated and has turned out of utility, also, for the control during construction. Diminishing the time invested for formal and financial decisions, Urban-I-graph ® permits to put more effort on the human, community and environmental qualitative aspects, which have been proved to be the difference among the successful low-income urbanizations in Venezuela and those which are not.

56-3 Building Urban Poor Community in Isaan: Design, Planning and Empowerment

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The paper illustrates the shift of urban poor housing policy and implementation in Thailand. During the last couple of years, its movement has boosted by community driven process supported by Community Organization Development Institute (CODI), public organization, initiating the program so called "Baan Man Kong". The program emphasizes on community, considered as the core mechanism, to work at the very fundamental level in order to improve the living condition as well as secure tenure and conduct to formulate the myriad of local partnerships at the end. The objectives of the paper are twofold. The former is to summarize the experience on the community development process in planning and design regarding urban poor housing through four case studies in Isaan, the northeastern region, where the urban poor generate the lowest average income in Thailand. And the latter is to depict lesson learning from experience and knowledge which has been exchanging among communities, academic institutes and local administrative bodies. This lesson learning could shed the further light on urban poor housing movement from pilot community to the others. Meanwhile, empowerment has apparently been issued when the urban poor housing movement encourages the decentralization of decision-making power to community people. This is not only the relationship changing between local government and community, but also between the groups of leader to the dwellers. The outcome from field practice positively reveals the interactive learning and communicative action planning affecting to local empowerment. Three concerned indicators – the increase of new leaders, the emergence of new neighborhood clusters and groups, and the change of local administrative mechanism, would mirror a significant step towards urban poor housing sustainability through design and planning process.

57-1 Sustainable Development Indicators for Taipei, Taiwan: Components and their inter-relationship

Yung-Jaan Lee, Graduate Institute of Architecture and Urban Planning, Chinese Culture University

Sustainable cities provide a vision for how individuals view themselves and their cities in terms of their physical, social, and economic environment. Since environmentalists first coined the term sustainable cities, scholars, planners, and developers have employed it to promote and facilitate numerous environmentally friendly changes to neighborhoods. Although the evolution of sustainable cities has followed the development of the broad notion of sustainability, defining either concept is neither quick nor easy. This work reviews current components of sustainable cities and proposes a model for Taipei City. This work first reviews sustainability and sustainable development that provide the foundations of the concept of sustainable cities. The concepts of sustainable development and sustainable cities are examined, and four components (environmental, social, economic, and institutional) of sustainability cities are also identified. Finally, a set of 53 sustainable indicators for Taipei City is proposed. Following two rounds of focus group discussions, a set of 20 key indicators is identified. A preliminary inter-relationship structure among these key indicators is proposed as well.

57-2 Development of Urban Sustainability Indicators and indices - evaluation of the sustainability of Irish settlements and settlement patterns

John Morrissey, Bernadette O'Regan and Richard Moles, Centre for Environmental Research, University of Limerick, Ireland

Sustainability and Future Settlement Patterns in Ireland (an Irish Environmental

Protection Agency funded project) investigated the relationships between settlement size, functionality and geographic location and sustainable development. Analysis was carried out on a representative sample of 80 Irish settlements, located in three regional clusters. Final research output will provide information for National Spatial Strategy planners, key stakeholders in the research. One aspect of the research was the development of a structured and comprehensive set of indicators and indices of sustainability. A set of forty indicators in four specific domains were selected and developed for the study settlements, ten Environment indicators, ten Quality of Life indicators, ten Socioeconomic and ten Transport indicators. In this way, developed indicators cover important aspects of sustainable development, environmental quality, equity and quality of life issues, as well as incorporating an area of pressing concern for the stakeholders, and for future settlement in Ireland, in Transport. Sustainability indices were evaluated through derived aggregation of indicators, to provide empirical summaries of the various aspects of sustainable development investigated. Final indicator and index presentation is achieved using GIS technology, to provide an easily queried and interpreted tool for stakeholders. Forthcoming from analysis has been the identification of attributes of settlements preventing, impeding or promoting progress towards sustainability. This output enables the prioritisation of actions to enhance the sustainability of Irish settlements. The empirical analysis of settlements by these methods has provided practical recommendations regarding the integration of sustainability goals with Irish settlement planning for the future.

57-3 How to deal scientifically with values in sustainability issues? A methodological analysis of two projects.

Paul Burger, University of Basel

Although public discussion and scientific papers on sustainable development are full of remarks concerning the influence of values for human activities and their according decision-making, the analysis of values and their influence has so far been underrepresented, probably also misrepresented within sustainability science. On the one hand, 'value' is a complex and difficult category to investigate. On the other hand, three specific streams dominate the theoretical work, the ethical debate concerning intrinsic values of nature itself, the economic approach on value as the price for an object or a service in an open and competitive market (for example willingness to pay) and – in accordance with a long-standing tradition in modern social sciences – a rather subjectivist's or psychologist's understanding of values as preferences in general. Moreover, many treat "value" and "good" as interchangeable expressions, whereas others makes a substantial difference by understanding "good" as expressing the entity, which may become a value. Differences in analysing values, however, may have great impacts insofar as there is more or less agreement within social and behavioural science that values steer in some way or another human activities. They do not only function as reasons for individual actions, but values are looked upon as being constitutive for action spaces for institutional or organisational actors within the different domains of the society. As sustainability scientists are interested in understanding human actions in view of a change toward more sustainable societies, attention in respect of methodological aspects for research on values becomes mandatory in view of the sketched background. We are all aware of the preferences – action gap in environmental issues. I am convinced that inadequacy of scientific value analysis is part of an explanation of that gap. In my paper I will firstly present five different theoretical concepts for values together with possible methodological consequences of the concepts. Then I will localise the systematic place for values within a human action scheme and ask for possible deficiencies of each approach sketched in part I.

Subsequently I will shortly present two projects (type questionnaire and type willingness to pay) and discuss them on the results of step two. As the type of shortcomings becomes at least to me very evident, I will end not only by calling for more methodological concerns in analysing values but by calling for a methodological effort in regard of how we become able to scientifically take into consideration the different levels or type of values adequately.

57-4 Impact evaluation of transdisciplinary research processes

Alexander Walter and Arnim Wiek, Swiss Federal Institute of Technology Zurich (ETH)

Transdisciplinary research projects are more often than not based on a real-world problem situation in the form of a case study. The case is analysed using scientific methods of investigation, while the case agents, being stakeholders of the process, are involved into the research project through transdisciplinary interfaces. Values and knowledge of the case agents are integrated into the research project. Finally, the project results in recommendations and orientations for the case agents, proposing to them what could be viable ways of dealing with the situation they find themselves in. While the quality of the transdisciplinary interaction between scientists and case agents is a very well researched topic of process evaluations, the evaluation of the societal impact of transdisciplinary research projects is still insufficiently targeted in the research on transdisciplinary modes of knowledge production. In this paper, the authors develop an impact model of transdisciplinary research, based on the theory of social impact studies. Two kinds of impacts of TCS are identified: a processual and a product-oriented impact, which both influence decisions that are thematically close to the transdisciplinary research project. This model was developed in collaboration with key case agents, thus ensuring that the conceptualization of the model also takes into perspective the case agent perspective. The model is applied on a case study of the long-term regional development of the Swiss canton Appenzell Ausserrhoden, which took place in 2001/2002, in an ex-post evaluation. By evaluating the influence of the two different kinds of impacts on decisions actually made after the study took place, the authors can identify the impact on the real-world problem situation. Using a path-analysis approach, based on the aforementioned model, the authors conducted a survey with the 180 case agents that participated in the case study. The correlation between their intensity of participation in the case study process, the different kinds of impact of the study, and the opinion of the case agents regarding important decisions in the canton (which are connected to the case study) are analysed. This evaluation approach is a major contribution towards an integrated assessment of transdisciplinary research processes (Td- Index), which is expected to result in a quality criterion for the transdisciplinary part of such projects that is comparable to the ISI

impact factor in disciplinary science. The paper contributes to the fields of scientific program planning and evaluation, transdisciplinary research and social impact research.

58-1 What Is the Maximum Acceptable Risk Level in China?

Jun Bi, Haiyan Zhang, Jie Yang and Weili Jiang, School of the Environment Nanjing University

The ecological effect of urban form is becoming an important research issue in the context of rapid urbanization of Asian cities and region at the early 21st century. However, the relationship among urban form, landscape pattern and their impact to the natural surroundings is still to be further explored. The normative theories or propositions of sustainable urban form were rarely tested by empirical studies and quantitative analysis. In the past decade, some research interests in spatial form, shape and pattern arises for describing the form of city, nature and landscape in a more quantitative ways. Batty and Longley measured the urban boundaries and edges, urban land use patterns and urban growth form using fractal geometry (Batty and Longley, 1994). At almost the same period, the quantification of landscape pattern has received considerable attention in landscape ecology, which focuses on ecological processes and their spatial configurations and forms (Forman, 1995; Farina, 1998, 2000; Turner, Gardner and O'Neill, 2001). Some quantitative approaches for measuring the forest shape, city form and landscape configuration are proposed based on landscape ecological principles and fractal geometry. However, the ecological meanings and implications of spatial form especially urban form are still less known. When we argue that the spatial form influences the ecological function, we have to answer it not only qualitatively but also quantitatively. In this paper, the urban and landscape form and its changes over twenty-year period of Singapore urban development are to be measured based on image processing and computation at GIS platform. As a common phenomenon in many cities and regions, the urbanization processes usually create visible changes of urban sprawl and landscape fragmentation. The spatial change breaks large habitat or land areas into small parcels and splintering shapes. By applying the principles of landscape ecology and fractal geometry using geographic information system (GIS) as a computing tool, some landscape ecological indices such as the patch number of forest, the compactness, convolution and fractal dimension of forest shape and city form and the heterogeneity of the overall landscape configuration are measured over twenty-year period of Singapore's urban change. Is Singapore city becoming more and more compact or sprawl? What constitute sustainable urban form? Some debates over the sustainable issues of urban form, landscape pattern, compact city and urban sprawl are to be verified in the case study.

58-2 Environmental Management Systems and Sustainable Development

Magdalena Rybaczewska-Blazejowska, Brandenburg Technical University, Cottbus Germany

The environmental management systems, including ISO 14001 and EMAS, have their roots in the environmental strategy of pollution prevention. They were developed as a response to international concern about environmental risks and damage expressed at the Conference on Environment and Development in Rio de Janeiro, 1992. Since the Earth Summit the organisations worldwide are being asked to consider their total impact on the environment and take steps forward to reduce and ultimately eliminate that impact. No longer the international community is satisfied when the organisations only comply with environmental regulations instead of steadily "raising the floor" on their performance-oriented environmental goals.

Many argue that the recommendation to deploy the environmental management systems more widely in non-industrial sector is based not on solid facts and figures related to environmental efficiency but on theoretical judgments. Despite these opinions, the author's research, conducted in the Polish municipal waste sector, strongly showed that although organisations need to think through their own specific market and environmental position, there are prizes to be won for those that decide to implement ISO 14001 or EMAS. Therefore, considering the three crucial parties concerned with an operation of the municipal waste treatment facilities – the municipal waste treatment facility itself, the authorities and the society – and presupposing that the municipal waste treatment facility is primarily interested in maximising profit, the authorities need to guarantee regulatory compliance, the society wants to be aware of the environmental impact and to have confidence that their waste are handled according to the highest standards in the sector – all these aspects are tackled by the environmental management systems. Ipso facto eco-certificates lead to benefits from ecological, legal and financial standpoint.

In consequence, to well managed organisations (including the municipal waste treatment facilities), the environmental management systems should be an activity performed on a regular basis to maximise long term profit, to guarantee regulatory compliance and to ensure that their operation does not have a detrimental effect on current and future generations. Assuming this, the applications of ISO 14001 and EMAS on a large scale is only a matter of time, if sustainable development wants to be achieved.

58-3 EcoStart - a Finnish Environmental Management System for SME's

Timo Juhani Lehtonen, Regional Council of Etela-Savo

The governmental authorities have a wide range of tools to promote eco-efficiency of enterprises. Among these are legislation, permission procedures, environmental fees and taxes and many kinds of subventions. To complete the above mentioned tool kit many more or less formal environmental management systems have been developed during the 1990's. The results of many projects and interviews among companies show that a formal EMS (ISO 14001 or EMAS) does not necessarily represent the optimal and most cost effective solution for all companies, in particular micro and small enterprises. The formal EMS's are considered to be too expensive and bureaucratic for

SME's. Although the environmental impacts of individual enterprises often remain relatively low, the SMEs altogether are responsible for up to 70% of all industrial pollution. Consequently, some less formal EMSs have been developed e.g. Norway, Germany and Austria. Now, also a less formal EMS called EcoStart has been developed for Finnish SMEs. During Spring 2006 six Employment and Economic Development Centres will begin to offer the consult service to the enterprises. The basic programme consists of 3-4 half-day workshops in the enterprise: Manufacturing/Service process;

Supply, purchase and use of energy, Environmental impacts of products (only in EcoStart_Manufacturing) and the Preparation of environmental program. Totally the basic program includes 6-10 consultancy days. The subsidize that is paid for the enterprise by the Employment and Economic Development Centre depends on the size of the enterprise and can be up to 80 %.

58-4 The effect of Environmental Management Systems on waste awareness in Finnish metal engineering SMEs

Sisko Kvist, Eva Pongrácz and Riitta Keiski, University of Oulu

The target of this research was to find out how do implemented ISO 14001 systems affect on the waste management practices and environmental awareness in small- and medium-sized enterprises (SMEs). In order to test the hypothesis that environmental management system (EMS) act as steering agent in SMEs, certified metal engineering companies were surveyed within two geographical areas of Finland. Questionnaires were sent to 26 companies, in which we asked about the attitudes and values of respondents, to evaluate their environmental awareness and commitment to environmental issues. The questionnaire also enquired about the amounts and quality of waste before and after implementing EMS. In order to compare the awareness levels and values of workforce and management, two different types of questionnaires were sent to the target groups. Based on this survey it can be concluded that waste awareness has clearly increased in these enterprises after certifying EMS. Implementing EMS has also improved the treatment of waste; less is going to landfill, more is recovered. Regarding commitment, people felt they are personally committed and are ready to comply with agreed procedures. The EMS certification process has also clearly raised knowledge levels, in particular on waste minimization, and respondents evaluated that their own attitudes toward environmental improvements have improved. While the treatment of waste has improved, there appears to be lack of activity in waste minimization and prevention. Notwithstanding, it can be asserted that certified EMS, together with legislation and economical issues act as a steering agents in SMEs.

59-1 Industrial ecosystems in Europe: Different facets of sustainable niches

Mouzakitis Yannis, Adamides Emmanuel and Goutsos Stavros, University of Patras

Although areas of concentrated economic activity constitute an important instrument for economic development, in various stages of their life cycle, they comprise a major ecological footprint and an obstacle to sustainable development. In both the academia, as well as in practice, there is a growing interest in the study of the transformation of these areas into more sustainable forms. The main concepts and ideas stem from industrial ecology and are directed towards the development of industrial ecosystems in the form of eco-industrial parks. In practice, the transition of regional industrial systems towards more sustainable forms is equivalent to socio-technical niche creation that is initiated by different drivers, takes place in different contexts, while structural elements of the initial and projected future states determine paths of evolution. Building on the nicheregime theory of socio-technical systems transitions, and through a study of ten cases of eco-industrial park development in European countries, we develop a conceptual model for the transition process. The model is useful for understanding the transition process, and for assisting policy makers, as well as managers, in the development of niches as stimuli for broader eco-industrial policies.

59-2 Industrial Ecology and Material Cycling: Toward closing the loop on material use.

Donald Isidore Lyons, University of North Texas

A central tenet of Industrial Ecology is the concept of closing the loop on material use by substituting used materials (waste) for virgin materials during production processes. A key, but as yet, unresolved question in this process is the geographic scale (local, regional, national, global) at which loop closing should take place. The theoretical debates in industrial ecology have often implicitly adopted the local scale for loop closing. While the local scale has been successful for large single process continuous waste streams, there is little apriori economic or geographic reasoning to suggest that most flows of recycled material can occur principally at that scale. As the famous maxim of Adam Smith states, it is the natural propensity to 'trade' and 'barter' across space and if this is the case, then that reality must be integrated into our theoretical and practical debates about how we close the loop on wastes. The purpose of this paper is to present some of the results from a previous study on loop closing among recycling and remanufacturing firms in Texas and to discuss the significance of those findings for our theoretical and practical understanding of loop closing in industrial ecology.

59-3 Building Local Institutional Base for Industrial Ecology: Pathway towards a Sustainable Urban Development for the Pearl River Delta

Xin Tong, Peking University

With robust economic growth driven by the fast development of export-oriented manufacturing, the Pearl River Delta has played as a regional economic engine in South China for over two decades. The continuous high economic growth induces heavy investment on more material-intensive industries, such as the petrochemical, steel,

automobile and heavy equipment manufacturing; which leads to increasing pressures from the perspective of regional sustainable development. In order to achieve a more balanced development, both the national and the provincial government have issued plenty of policies to improve the efficiency of input resources, particularly through land use planning. However, the regional economy, characterized by a thriving private sector with millions of small and medium enterprises (SME), is vulnerable to such top-down control from the higher level government. With the case on chemical industry, this paper suggested that greater attention should be placed on the local actors as promoting industrial ecology in the urban planning, to provide an essential local institutional base to build long-term development capacity at the community level.

59-4 End of Life Vehicle Directive as regulation for interfirm co-operation: a critical study of industrial ecology as a policy initiative

Pauline Deutz, University of Hull

Industrial ecology as a business oriented eco-efficiency initiative is distinguished from others by its emphasis on interfirm co-operation. The attention of academic proponents of industrial ecology has recently expanded from examining potential benefits of co-operation to methods of realising them. One approach is to directly encourage networking between firms. A second approach is to adjust the 'boundary conditions' within which firms function (Allenby, 1998), to incentivise co-operation. Whilst that could be attempted through a variety of policy instruments, even the suggestion of regulation has brought about interfirm co-operation in an effort to make the regulations unnecessary. A major example of this arose in the UK in response to the drafting of the EU End-of-Life Vehicle Directive, legislation which is arguably an attempt to implement industrial ecology principles. Representatives of firms from along the automotive supply-disposal chain came together but co-operation was not characterised by a high level of trust, limited in scope and finally gave way to competition between different interest groups. Informed by interviews with vehicle dismantlers and other relevant company representatives, this paper assesses the barriers to co-operation, and the implications for the implementation of industrial ecology.

61-1 Acupuncture Method - Sustainable Planning In Experimental Case Study of Xiafutou Village

Limin Li¹, Hongyo Lu² and Hua Zhang³, (1) Xi'an University of Architecture and Technology, (2) Zhengzhou University and (3) Henan Civil Engineering University

By the influence of Urbanization, the diverse rural architecture systems in China were losing their local characteristic, which the complete village pattern was being damaged and the rural building system shows strong trend to be monotonous and tried to copy from the city by levels.

Based on the Sustainability definition, Xiafutou Village was researched by local, informed, participatory and balanced-seeking way fetching in the theory of System Science and Chinese Medicine Theory. With participatory evaluation, guided by seven principles of village sustainable development, we regarded the village modality as a complicated and dynamic system, which included natural ecology system, rural economy system, social-culture system and village modality and rural building system. Found on the analyze, we tried to find out the key acupuncture points to inspire the village sustainable develop with acupuncture method.

61-2 MFA-based Analysis of Sustainable Development in China

He-ping Huang and Jun Bi, State Key Laboratory of Pollution Control & Resource Reuse, School of the Environment, Nanjing University

The economy and the environment are linked through material and energy flows. These flows on the one hand are driving forces for economic development and pressures for the environmental protection on the other hand. Therefore, material and energy flows to some extent can serve as the proxy indicators for the degree of sustainable development. A higher material and energy efficiency reflects a better achievement of sustainable development, and assumes that the stress is within the limit of environmental carrying capacity. This article described the principle and methodology of using material flow analysis (MFA) to evaluate the degree of sustainable development in China. Relevant indicators were chosen on the basis of accounts and balances of material flows compiled for China from 1981 to 2003. Indicators of material flows presented here were a comprehensive set of material flow accounts in a rapid transforming economy. The results showed that the total amount of material flows in 2003 was 2.6 times that of 1981. By 2003, material intensity per capita was almost doubled, while material intensity per unit GPD was one-ninth that of 1981. Using material flows as a proxy indicator for environmental pressure, the analysis showed that environmental threaten had not been reduced in the past two decades due to a rapid economic growth rate of 9%, though the material using efficiency had been greatly increased. Further analysis of material flows at provincial and national levels will be illustrative for decision-making at provincial and central government levels.

61-3 The explanation of relation between social capital and quality of life

Gholamreza Ghaffary and Nazmohammad Ounagh, Social Insurance

This article is dealing with the relation between social capital and quality of life in three different locals of Gonband Kavos city, Daneshjoo, Shariati and Bedeljah Seyedabad. The indexes used for measuring the quality of life are health and nutrition conditions, materialistic quality, environmental circumstances, access to public services and mental well being. Regarding social capital the following indexes have been used; social trust, communications, transactions and local security. Statistical data analysis of this research demonstrates that the relationship between the two structures, social capital and quality of life, is consequential in a confidence level of 99%.

Furthermore, social capital has clarified that 36% of the changes in the quality of life are based on four measures of local security, transactions, the image regarding the district, and membership in associations. In the meantime, in the scale of the districts under study, the findings of the research indicate the differences in social capital and consequently differences in quality of life.

62-1 The Challenge to Sustainable Development of Urban Slums with particular Reference to Dhaka

Rowshan Mamtaz, Bangladesh University of Engineering and Technology

The main aspects of sustainable development of urban slums are water supply, sanitation, drainage and solid waste management. Although in the recent years several approaches have been proposed and adopted to improve the conditions in urban slums, most of them have actually failed to sustain, once the initial support was withdrawn. The problem is particularly acute in Dhaka where many of the city's poorest population live in more than 3,000 densely populated slums in abject environmental conditions.

This paper presents the existing conditions of water supply, sanitation, drainage and solid waste disposal system of some typical slums in Dhaka and identifies some major constraints to development such as legal rights and violence against women. Community participation is an effective means of attaining sustainability. The success story of water point and barrel composting shows that enhanced community participation at the decision making level is crucial. Women and children play an important role in sustainable solid waste management. Low-cost techniques are also effective in attaining sustainability. The most important factor is the awareness of the slum dwellers that positive change is possible. Finally the coordinated effort of the slum dwellers and the GOs and NGOs makes the development of slums sustainable.

62-2 Compact residential developments and its effect on sense of community in contemporary China - Cases studies in urban Guangzhou

Yingqing Ou, Beisi Jia and Stephen S.Y. Lau, The University of Hong Kong

Urban sprawl has been criticized in western countries for its environmental and social cost. Contemporary urban planning theory such as Compact city, New Urbanism, and Urban Village promotes high density, mixed-use, and pedestrian-oriented environment as an alternative urban form to achieve not only environmental but also social sustainable development including sense of community. China is experiencing a housing reform and rapid housing construction. This process has resulted in urban sprawl. However, these developments have been claimed to cause the decline on sense of community. This study is an attempt to evaluate the current residential developments in terms of compact attributes and to explore the effects on sense of community.

62-3 Sustainable Development of the Egyptian Village - Demonstration Project at El Hay Village - Giza Governorate

Magda Mohamed Tawfik Metwally, Housing & Building Research Center, HBRC

Although rural population in Egypt reached about 57% of the total population, the rural areas have been neglected for a long time. Limited interest had been given to rural development in Egypt until the late 1940s, but interest increased relatively after the revolution of 1952, and became more pronounced after the adoption of a local administration system in 1960. The 1980s witnessed the implementation of a number of programs for rural development but these had a limited impact on the socioeconomic life of the rural population. This was due to the partial approaches and scarce development that characterized them and the absence of community participation in planning, implementation and monitoring of development programs.

Most of rural settlements suffer from insufficient infrastructure and services, lack of employment opportunities, pollution and environmental degradation resulting from the lack of sanitation and solid waste management, and the agricultural land conversion to urban use.

The paper deals with the implementation of a demonstration project for the development of an Egyptian village, which constitutes a part of a recent research project sponsored by the "Academy of Scientific Research and Technology" and conducted by a research team in the "Housing and Building Research Center" under the supervision of the author. The project implementation will be financed by the Social Fund for Development SFD in coordination with local authorities, private sector & the local community.

The paper presents and analyses the existing situation and main characteristics of the selected area. It outlines the proposed project to be implemented with special focus on the participatory approach for planning and rehabilitation of the rural settlement.

The overall goal of the demonstration project is to promote the economic and social development of a poor rural community on a sustainable basis. The demonstration project presents an integrated package of socio-economic sustainable programs based on bottom - up problem solving rather than top-down decision making, and driven by local needs and opportunities. The project provides a practical tool to bring together, on the one hand, development needs defined by community groups and on the other, the resources and technical skills of government, donor agencies, and non-governmental skills and external technical knowledge in the development process.

Dissemination and training programs will follow to share the demonstration project results with other rural communities and local authorities, and to replicate the project in other governorates.

62-4 Sustainable Development and Transit-Oriented Development Cities in Taiwan

Chia-Nung Li and Tsung-Yu Lai, Department of Land Economics, National Chengchi University, Taiwan

The goals of transit-oriented development (TOD) in the United States are to restrain urban sprawls, promote efficiency of land development, protect environment resources, guide urban development patterns, and build a highly livable environment. Within this context, many strategies are gradually developed to achieve these goals. However, how can one know that TOD programs and strategies achieve claimed goals efficiently? The crux is lack of a system provided for making the effectiveness and efficiency of TOD strategies and programs. Thus, this paper aims at illustrating about sustainable development and TOD. In order to provide workable tools for achieving TOD goals, an evaluation model and implementation tools are suggested. It is hoped that this system can provide the government a guideline for managing urban development and land use policies.

63-1 The Role of Participatory in the Upgrading and Preservation Process of the Vernacular Architectures

Hongyi Lu¹, Limin Li² and Hua Zhang³, (1) Zhengzhou University, (2) Xian University of Architecture and (3) Henan Civil Engineering University

The diverse vernacular architectures and villages that reflect the diverse culture patterns in China developed themselves under the bottom-up growth logic that closely works with participatory. Therefore, it is very important to build up a participatory decision process and integrative system of top-down and bottom -up mechanism under its current upgrading process. Moreover, it is a key issue to protect and preserve the vital and dynamic characteristic of the local culture during its upgrading and developing process.

Using concrete village study, this article aim to discuss the role and meaning of participation in the rural building upgrading process. And at the same time, it offers a new comprehensive and dynamic methodology to the practice to a sustainable rural housing upgrading process.

63-2 The need and the meaning of sustainable renovation

Marina Botta, Royal Institute of Technology, School of Architecture

The focus of this paper is on existing housing areas: in industrialised western countries, today, the number of existing buildings that need to be taken care of, maintained, repaired, renovated or restructured is higher than the number of buildings that need to be built. In other countries sustainability demands an environmentally conscious construction of new housing and new urbanisation, but also a tackling of the problems of low energy efficiency, maintenance and conservation of cultural historical heritage as well as traditional dwellings. The aim is to present the concept of sustainable renovation as an approach meant to increase the sustainability of a building or a built area, without damaging its qualities and with respect for the users. Sustainable renovation attaches importance to the process of change going on in the renovation sector and to the intentions, the attitudes and the role of different actors in taking care of the existing built environment for present and future inhabitants. This paper is based on empirical material and further reflections from Swedish housing renovation and reflects about the positive results, conflicting interests, incongruities and challenges that may be found in renovation projects and renovation policies aiming at contributing to a sustainable development.

63-3 Vernacular House pattern in Chinese villages - A systematic thought to the Nature and Society

Qing Zheng, Hongyi Lu and Xiu Shi, College of Architecture, Zhengzhou University

There is variety of vernacular architectures in Chinese villages because of its geography diversity and culture specialty. These buildings that developed by our forefathers reflect the systematic thought in the traditional architecture culture to the Nature, Society and Economic mode at that time.

We can draw a conclusion of the systematic thoughts of the traditional architecture culture in the followings: 1. Systematic thought of the settlement of its surroundings-Fengshui and Organic pattern of the settlement and its environment (Ex. Principles of Site Choosing and Building Pattern); 2. Systematic thought of Neighborhoods and Village Community-Familiar Society and self- independent of a house and Open and connection of a village in a whole in the village pattern; 3. Systematic thought to the Self -Sufficiency economic mode- village and house exists as a agriculture unit for both working and living.

64-1 How to sustainably optimize a system? - A comparison among scenario-based assessment, impact assessment, and systemic assessment

Daniel Lang and Arnim Wiek, Swiss Federal Institute of Technology Zurich (ETH)

A major challenge in dealing with sustainability is to select appropriate normative reference states or conditions for assessing and optimising a system. There are different approaches available that are supposed to adequately deal with this problem. The scenario-based assessment approach constructs a desirable future state as reference point. The impact assessment approach focuses on impacts of system processes and their significance for sustainable development. The systemic assessment approach focuses on the current system state and assesses basic mechanisms underlying the system according to system theory principles. Although these approaches overlap in various aspects, a prototypic differentiation is important to reveal basic strengths and weaknesses of the approaches. The paper presents a comparison of the mentioned approaches with respect to the epistemological

background, the methodologies, the applicability to different scales of human-environment systems and the compatibility of the approaches.

64-2 SEA as a Tool to Achieve Sustainable Development in Hong Kong and the Pearl River Delta

Elvis WK Au and H.M. Wong, Environmental Protection Department, HKSARG

Strategic Environmental Assessment (SEA) is a proactive tool for integrating environmental considerations into spatial and sectoral policies, plans and programmes (PPP) formulation and implementation. In the traditional project level environmental impact assessments, very often the yardstick used would be whether a proposal, with or without mitigation, would create unacceptable impacts in exceedance of established standards and criteria. However at the SEA level, the international trend is moving towards the adaptation of Sustainable Development principles and parameters as the yardstick in determining the acceptance of PPP proposals. Therefore, the SEA process has indeed linked up the PPP formulation with the question of whether it will help achieve sustainable development or not.

The Hong Kong EPD has been promoting the use of SEA in the past decades and recently has also published a SEA Manual and set up a SEA website. This paper will present, with some actual examples, the SEA process in Hong Kong; how the process would help in fostering more debates on achieving sustainable development; and most importantly how the SEA process could contribute to Hong Kong and the nearby region being more sustainable in the long run.

64-3 Is Milton Keynes a Sustainable City? A sustainability assessment of its energy use past, present and future

Helena Titheridge, University College London.

The UK new town of Milton Keynes has an urban form more reminiscent of a US city than a European city. The town was constructed to a master plan with the goals of providing opportunity and freedom of choice; easy movement and access, good communications; balance and variety; an attractive environment; a place where public awareness and participation is important; and a place where resources are used efficiently and imaginatively. As such the town appears to incorporate many features that favour long-term sustainability (e.g. its wealth of green spaces, a number of energy efficient buildings and renewable energy projects), although others appear unfavourable (e.g. its over reliance on the motor car). This paper discusses the sustainability of Milton Keynes' current energy use and explores the city's future energy use, using a sustainability assessment methodology, which combines an energy and emissions model (DREAM-city) with an impact database to appraise the wider impacts of different energy futures. The results show that current energy consumption is comparable to that for other UK cities and that any future energy strategy for the city needs to be planned carefully if they are to be effectual.

64-4 Sustainable Development Indicators As Catalysts of Urban Change

Clara Landeiro, CESUR - IST - Technical University of Lisbon

This paper examines participatory initiatives in the movement towards urban sustainability, focusing on the potential role that indicators of sustainable development can play as catalysts of urban change. Although most efforts have focused on developing and institutionalizing sustainability indicator systems (SIS) at different scales, from the municipal to the global level (e.g. OECD and EU), this paper will focus on the local level - the city-neighborhood scale. It is argued that building sustainability indicators at the local level can be a crucial tool for generating a broad agreement on the implementation of the principles of urban sustainable development and can help mobilize communities (residents, investors, scientists, and government) to actively participate in urban regeneration processes. Recent experiences in the development of SIS are highlighted and results from the West Oakland Indicators Project are presented to illustrate the potential of local SIS efforts to operationalize urban sustainability. In this neighborhood of the City of Oakland, California, the local community, together with researchers and local and regional agencies, developed, agreed on, and produced a set of indicators to measure the progress of their community towards sustainability, serving as the catalyst for local action in a number of urban management and planning issues.

64-5 Measuring Regional Sustainability - lessons to be learnt

Anne Maree Wallis and Anneke Richards, Deakin University

Sustainability is a concept recognized as having broad and varied meaning and hence developing tools for measuring progress toward sustainability has proven a challenging task. "Sustainability indicator" as an expression is becoming widespread as indicators offer an excellent means to explore the success or otherwise of management strategies. They also allow reporting social, economic and environmental aspects of sustainability. In order to ensure tools developed are effective in measuring progress toward sustainable futures, evaluation of methods and indicators must be undertaken so that with progress there is learning and with new knowledge methods can be redesigned to better advance sustainability. This paper continues the existing discussion on measuring sustainability. It does so by discussing a study carried out in the south west region of Victoria, Australia, using indicators as the basis for developing a tool to measure progress toward sustainability. By evaluating the methods and indicators used in the study the paper aims to provide insight into the challenges encountered and the lessons

learned. Issues explored include selection of indicators, collation of data, integration of social, economic and environmental aspects, stakeholder participation and sustainability reporting.

65-1 Geothermal Energy for Sustainability

Daisy Badilla, Ateneo de Naga University

Geothermal energy is a source of electricity in 21 countries including the Philippines with 27 percent of its electricity produced from geothermal sources. The Philippines is the second-largest producer of geothermal energy in the world and has one of its geothermal power plants in Tiwi, Albay in the southern part of Luzon.

Energy is important in sustainable development since it affects development in all aspects - social, economic and environmental. This is a study on the community's assessment of the socio-economic contribution of Tiwi Geothermal Power Plant to development needs particularly on education and livelihood of the people.

The data in the study were gathered through focus group discussions, key informant interviews, and observations. The results may be used as a basis for policy-making and in developing local capacity to ensure sustainability of the geothermal field.

With the goal of the Department of Energy in the Philippines to increase renewable-energy-based capacity by 100 percent by 2013 and with its aim to be the number one geothermal energy producer in the world, impacts on communities has to be taken into consideration and need to be assessed. This study is an effort to answer such need.

65-2 Urban Energy Systems Engineering

Paul Rutter, Nilay Shah and Cristina Romano, Imperial College London

This paper describes the Urban Energy Systems Engineering research project that has recently started at Imperial College. The objective of the research is to document and understand in detail how energy, people and materials flow through a city and to use this information to help improve the efficiency of both new-built and existing cities.

65-3 Local Housing Action, Energy Retrofitting and Sustainable Energy Use for Wellbeing and Sustainable Communities

Kay Saville-Smith, Centre for Research, Evaluation and Social Assessment

We explore the impacts of energy retrofitting of houses in poor communities in relation to three sets of outcomes: energy efficiency; improved wellbeing for participant households and community development impacts. It considers those impacts in the context of the tendency for New Zealand households to use relatively little energy for heating and New Zealanders' apparent unwillingness to heat their houses to the levels deemed comfortable and healthy by the World Health Organisation. The paper considers the range of social and dwelling factors that drive energy use and the extent to which disadvantaged groups are likely to have energy use behaviours or live in dwellings that have colder temperatures and may expose them to conditions not conducive to well being. With reference to the retrofit programme in the Eastern Bay of Plenty, one of New Zealand's poorest areas and an area in which there has been a persistent problem of poor housing conditions, we then show how local housing action by community groups can be a practical pathway which realises both community and environmental sustainability outcomes.

65-4 The Success Project - Energy analysis and sustainable development

N. D. Mortimer¹ and John Francis Grant², (1) North Energy Associates Ltd; (2) Sheffield Hallam University

This paper summarises the methodology and results of work involved in the investigation of energy demand in 6 Chinese villages included in the SUCCESS Project. The procedures used to collect data associated with local energy demand is explained and the approach to data analysis is explained. Results are provided in terms of delivered energy consumption, as an indicator of energy demand, primary energy consumption, as an indicator of energy resource depletion, and carbon dioxide emissions, as an indicator of global climate change. Similarities and differences between results for this sample of villages are considered. The important causes of differences in results are investigated. Using these estimates as a baseline, the relative potential for improving energy efficiency and utilising local renewable energy sources has been examined. Major potentials for sustainable development have been identified, and their net savings in annual primary energy consumption and carbon dioxide emissions have been calculated. These net savings take into account the fact that fossil fuels are often consumed and carbon dioxide is emitted, directly or indirectly, when energy efficiency measures and renewable energy technologies are manufactured and operated. In this analysis, the options have been ranked, approximately in the order of most likely implementation. This ranking reflects the relative economic viability of options although their economic costs are not determined specifically in the reports.

65-5 Psychological Aspect to the Solar Energy Utilization in Bilbao

Eduardo Rubio-Ardanaz and Xiao Fang, University of Basque Country

Spain is a country full of sunshine. Its wonderful natural background promotes people in Spain to pay more and more attention to the solar energy utilization. Bilbao is an important industrial city with high-density population in Spanish Basque Country, and the local people have begun to use this new energy in their daily life. This paper tries to conclude the actual situation of the utilization of the solar energy, and then analyses the impact factors to make the decision of using this new energy from the viewpoint of the psychology. Based on this, some suggestions to how to promote the utilization of the solar energy are put forward.

66-1 A Multifunctional Agriculture for China - Considerations following a strong sustainability approach

Veronika Praendl-Zika, The Vienna Institute for Urban Sustainability, Oikodrom

China is currently undergoing rapid changes in many respects, mostly noticeable in big towns and cities in terms of economic growth and consequentially with effects on social, environmental, infrastructural and political systems there. The rural areas, where still 70 % of the Chinese population is living seem to be not so strongly affected by these tendencies until now. 70 % of the rural population are still farmers and live on or somewhat above subsistence level. These are about 50 % of the total population of China. Hence, China's agriculture is extremely small structured with an estimated average size of farmland/farm of about 0.5 hectare and the per capita arable land comprises about 0.11 ha, which equals only one-third of the world's average [2]. China...is now feeding 22 % of the world's population on about 1.3 billion hectare, which only accounts for 7 % of the world's cultivated land.

66-2 Opportunities and constraints for a chain-network conversion towards sustainable dairy production in The Netherlands.

Arnoud A.H. Smit, P. P. J. Driessen and Pieter Glasbergen, Copernicus Institute for Sustainable Development and Innovation

Agricultural production is often perceived as being unsustainable due to high external input such as crop protection and fertilizers. Since primary producers are the ones that actually use these external inputs they are often given the sole responsibility for changing the mode of production. We, however, assume that in order to make agricultural production sustainable, all actors within the total supply chain must be involved. Furthermore, we assume that stakeholders such as NGOs are of influence too. We have therefore conducted case studies on three Dutch supply chains, one of which is the dairy supply chain. From a chain-network perspective we have analysed this supply chain – and their surrounding network of stakeholders – on opportunities and restraints for a conversion towards sustainable production. We found that the dairy supply chains are working hard on making their production more sustainable and in line with our assumption we have found that this is an effort of all actors within the supply chain. We also found that network actors force and persuade the supply chains into a more sustainable production. Even though these efforts result in a more sustainable production, the sector is still quite far from sustainability. Therefore, governance is needed.

66-3 Energy and Environmental Analysis of an Italian Wind Farm

Fulvio Ardente¹, Gorgio Beccali¹, March Beccali¹, Maurizio Cellura¹ and Robert Intili², (1) Department of Energy and Environmental Researches, University of Palermo and (2) Sicily ENEL Scienze

Renewable energy sources are often presented as "clean", not considering the energy consumption and the environmental impacts related to the plant's life-cycle. The paper aims to evaluate the energy and the environmental performances of the electricity production of a wind farm. The impacts related to the plant production and use have been compared to the environmental benefits due to the electricity production during its useful life. The goal is to trace the eco-profile of the production of 1 MJ of electricity.

It has been performed a Life Cycle Assessment (LCA) based on data directly collected in an Italian wind farm: production and deliver of energy and raw materials, production process, installation, maintenance, disposal and transports have been analysed. Particular attention has been focused to those life cycle steps generally neglected or not adequately investigated as installation, civil works and maintenance.

The results have been synthesised by two indicators: the energy and the environmental payback times. Payback times lower than one year have been estimated. That demonstrates the great energy and environmental convenience of this technology.

The results can be assumed as representative of the Italian context and they can represent a further incentive to the diffusion of wind farms in the Italian case study.

66-4 Conflict Between Agricultural Industrial Structure and Non-point Source Pollution in Lake Tai region and its Countermeasures - Case of Dapu town

Dongmei Jiang¹, Xiangying Yu², Minghui Liu² and Genfa Lu³, (1) Environment School of Nanjing University, (2) Zhengzhou Teacher College and (3) Nankai University

This paper examines that the water pollution of Taihu Lake valley is gradually deteriorating because of the Non-Point Source Pollution. It also analyzes the conflict between the Agricultural Industrial structure and Non-Point Source Pollution, and then put the case of Dapu town in Yixing city of Jiangsu province. Furthermore, it inquires into how to negotiate the relationship between managing water environment and the development of agriculture and rural region.

68-1 Population Amount Research during the Eleventh Five-plan of Jiangsu Province

Ning Liu, Genfa Lu and Yuan Wang, Environment School of Nanjing University

From the angle of system theory, the sustainable development composes five basic domains, namely, population, economy, society, environment and resources. First, the paper sets forth that the population is the key factor to the sustainable development in China, and the research on the population index includes the control of population increase, the improvement of population quality and the adjustment of population structure with the strategy in combination with control, improvement and adjustment. The paper highlights the control of population with the quantitative analysis. Under the direction of dissipative structure theory and based on the land ecosystem carrying capacity, the paper puts forward the concept of population control range of sustainable development in theory, which is the concept of domain, not simply specifying the population of sustainable development as a specific value. Because there is a big difference between South and North of Jiangsu Province in economy and living conditions, the paper takes Zhenjiang City as the example to make analysis, together with the population variation data of four counties (Dantu, Danyang, Yangzhong and Jurong) of Zhenjiang City from 1978 to 2001 and the data of the land carrying capacity of Zhenjiang City and gives the control range controlling the population growth during the eleventh Five-Year Plan of Jiangsu Province. Moreover, the paper makes qualitative analysis on the improvement of population quality and the adjustment of population structure.

68-2 Ecological Jiangsu Initiative Assisted by the Experience of Sustainable Development in the Austrian State of Victoria

Jing Xia^{1,2}, Stuart Menzies², Wanghua² and Bi Jun¹, (1) State Key Laboratory of Pollution Control and Resource Reuse, Nanjing University, China; (2) Jiangsu Provincial Academy of Environmental Science, Nanjing

Ecological Jiangsu is ambitious; however, sustainability in the province relies on efforts being made to achieve this outcome. The vision for an 'Ecological Jiangsu' has been formally adopted by the Government. The paper compared the current level sustainability in Jiangsu and the Australian State of Victoria. Following this comparative assessment, we take the environmental governance as an example to point out the new direction for Jiangsu. The new directions primarily draw upon the good experience of Victoria. Finally the outcomes of the comparative study were given as well as some suggestions.

68-3 The payment of the public services in poor communities: An indicator of responsibility for financial and social sustainability of a development program. The case of the Program "Full Citizenship" -PCP-. Municipality of Maracaibo, Venezuela.

Marina González de Kauffman and Estela Peña, (1) Universidad del Zulia -LUZ- University; (2) Servicio Fondo de Desarrollo Microfinanciero de Maracaibo Alcaldía de Maracaibo

The PCP Maracaibo intends to relieve the poverty conditions of the 60% of the population of the city, focused in the strengthening of human and citizenship dimensions by means of permanent training and the motivation of micro-credits. National funds were granted in 2003 for its municipal coverage, but its purpose is to be self sustained by means of the capitalization of the micro-credits investment. That is why the reimbursement of the credits is fundamental, for which guarantee mechanisms are implemented and some indicators evaluated pre and post the granting. Nevertheless, the reimbursement of the credits has been observed affected by beliefs and perceptions of the social group involved, mainly related to the governmental participation in the Program. This work intends to demonstrate that the regularity in the payment of some public services can be a reliable indicator to diminish the financial uncertainty associated to the credits, because they establish a relationship with the local government similar to the Program, that is promoted for a partnership of the municipality, two NGOs, academia, international agencies and the own community organizations. Also, it is verified that several participating families in the PCP, that were not solvent before with the public services, on a middle term are assuming their regularization, since the Program capacitating impacts directly on the form of social relations, beliefs and civic values.

69-1 Community Plans for Sustainable Living

Bev James¹, Kay Saville-Smith², (1) Public Policy & Research, Wellington, (2) Centre for Research Evaluation and Social Assessment, Wellington

The design and management of the built environment and its bio-physical impacts are frequently the primary focus of action in the search for sustainable cities and settlements. This paper describes a process of developing a community plan for a greenfields settlement within one of New Zealand's fastest growing cities within its largest metropolitan area. That process was designed to incorporate the needs and aspirations of people into the heart of designing a sustainable new town. The vehicle to do this was a community plan developed through the local council and its community board. That community plan proposes a set of community objectives and priorities under the following themes: educated and knowledgeable people; healthy people; transport; safe communities; sustainable environment and heritage; thriving economy; and, vibrant and strong communities. In this paper we describe the process and present the elements of the resultant draft community plan. Those elements and that process demonstrates the complex relationship between the design of the built environment and the people for

whom that environment needs to serve, and the importance of a strong partnership between local governance mechanisms, technical experts and local communities if truly sustainable neighbourhoods are to be built.

69-2 Optimum population density and agglomeration of cities in terms of energy saving

Kenichi Imai, Kinki University Technical College

A concept of compact city is arguably the best solution towards sustainable development of cities in its merit of energy saving. Though the concept is attracting the attention of government officials, city planners and citizens in Japan, there is not enough evidence to support its environmental merit. This paper tries to provide a theoretical foundation for such a discussion. First, the compactness of Japan's 745 cities are analyzed with the data on their population size and population density and agglomeration in their urban districts. Then, an economic model is constructed so that it could explain how the compactness of cities determines the trip distance to city facilities and workplaces, thus the level of energy consumption for trips. Important implications of the economic model are firstly that there is an optimum level of compactness for cities in terms of energy saving and secondly that such an optimum level of compactness depends on industrial structure of cities.

69-3 The New Built Environment in the UAE: Globalization versus Sustainability and Local Identity

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Modern UAE has become an important hub in the world global economy. Its evolution and progress has become an example for inspiration and/or imitation in the region. Dubai, as the major city, stands as the successful model of this approach. A success not entirely based on oil but on smart and timely business actions which the local government has undertaken since the seventies; i.e. the creation of the free zone at Jabel Ali and the offered incentives to attract international companies.

The evolution of the UAE and Dubai in particular has also led to a speedy urban development. For the last twenty years the city has witnessed an increasing number of construction sites relentlessly and with non stop; always new needs and hence new projects to be executed. So far, the local authorities have managed to 'control and combine' the will to have a leading city in world business and tourism with a fast urban development program. Unfortunately, Dubai has also encountered the problems associated with modern and international cities such as traffic, noise, pollution and disintegration and/or loss of local identity. This situation has led lately to an awakening of awareness about the future of the built and natural environments.

This paper will look at the impact of globalization in the UAE, focusing on the new built environment and in Dubai as a case study. The paper will also discuss the new awareness present in the city on local identity and sustainability. This latter, despite its limited implementation in the development process, is slowly rallying support.

69-4 Emerging cities in India and China: Enormity of challenges to ordered development

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The emergence of huge number of cities in India and China is compelling. These cities, that were till now only considered as third-tier cities or big townships, are experiencing rapid increase in per city per capita GDP. This has resulted in serious deficiencies in the quality of living in these cities because of failure of city-planners to keep pace with the demands. The enormity of challenges to monitor, regulate and implement practices that promote ordered development in newly emerging metropolitan areas is substantial. Hundreds of cities need to be considered in detail and their unique problems need to be addressed individually. As part of the effort, demography of each of these cities is being studied and mapped. A hypothetical system of banding is devised to categorize these cities and the problems of the cities falling in each band are discussed. To achieve sustainable development, the territorial significance of each of these cities needs to be considered. Many conflicting interests have emerged and a consensual approach needs to be adopted. Absence of well-devised territorial entities has resulted in treatment of these new areas of urban development to be treated on par with general human settlements. This is posing unusual constraints to the free and ordered community improvement practices. We will look at few interesting constraints influencing the situation. As the concerns raised are applicable to many developing and transitional economies, we will try to seek generalized solutions.